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EDITORIAL NOTES.

Improving on the Past.

IN some respects, it is a pity that, in planning works for industrial purposes, one cannot see a considerable distance into the future; so that what is done at one period would not stand in the way of the best application being made of the developments of a future period. But, however clear-sighted one may be, it is impossible to know positively beforehand the nature of evolutions in the future. This very fact, however, gives scope at some time or other to engineering ability in fitting advance to old conditions. The larger a scheme that any engineer has to design and bring into being, and the more extended the components of the scheme, the more difficult it will be for any engineer in time, (say) a few decades ahead, to introduce into the fabric of his predecessor's work the advance that has been achieved in the intervening years. Thinks any constructing engineer that, had the original engineering creator of Beckton foreseen what was to happen by, and during, the first decade of the present century, he would have laid out that gigantic works in the manner he did, with the retort-houses constructed end-on and the transport system about the works arranged in the manner in which it exists to-day? The planning of Beckton showed skill; and it provided the most economical method of working known at the time. But the plans confine the engineer of to-day; and, however interesting may be the puzzle as to how best to incorporate advances as opportunities arise, it strains at skill and responsibility in devising and contriving to reach the desired end in the most economical and profitable way. These are points that have to be borne in mind in considering any individual piece of reconstruction work that is brought before one in connection with Beckton; seeing that the works cannot now be reorganized in their every part, nor large solidly constructed buildings be lightly sacrificed. At Beckton, as at other works, each case of re-equipment along the lines of modern practices has to be considered on its own merits; and, in the case of such large works as those of the Gaslight and Coke Company, and under the conditions of those works, every case, Mr. Thomas Goulden, the Company's Chief Engineer, will tell one, supplies the subject for an interesting study, the measure of the success of which study is shown in the ultimate working results.

These thoughts arise out of the paper that Mr. Goulden contributed, from the large store of his information and experience concerning such matters, to the proceedings at last Thursday's meeting of the members of the Eastern Counties Gas Managers' Association. The paper dealt with the conversion of the No. 12 house at Beckton, which, we believe, is the largest of the several houses there, and a few days' maximum production of which house would suffice for the whole of the annual requirements of some of the members of the Association. But that is not the fault of those members; it is the fault of their location. Mr. Goulden did not contribute his paper for comparative purposes outside the house itself. The problems that arose, and the comparisons between the results of the old and the new equipment within the house limits, furnish ample points for engineering interest, though not much room for discussion. The very size of the house, the extensive character of its equipment, and the increased output from within the same walls, all go to show the remarkable progress that has been made in retort-house practices during the past thirty years, which compass the time when the house was originally equipped and when it is now working under modern conditions, which conditions it is not suggested are superior to others, but are the best, in Mr. Goulden's opinion, for the internal and external circumstances of this particular house. From the engineering point of view, the old equipment was the best known at the time of its installation; but the contrast in the equipment of thirty years ago and of to-day is made the more striking by its magnitude. In the old house there were settings of nine retorts, aggregating 405 retorts, of ⌂ section, and in the maximum cross measurements 20 in. by 13 in.—in all representing 8100 lineal feet. In each of the new settings (the design of which has also brought about improved heating) there are ten larger retorts 24 in. by 18 in., aggregating 440 retorts, and making a total length of 8800 feet. Six pairs of drawing and charging machines were originally installed, and four pairs were used, working on both sides of the house, with a pair on each side as a stand-by. Two Fiddes-Aldridge machines now do all the work on one side of the bench. Instead of the former eight sets of coal breakers and elevators, with their separate machinery, each two of the four sections of settings are now dealt with by one line of coaling plant, as described in the paper. Coke removal was formerly effected by manual labour. Each section of retorts in each half of the house has now its own hot-coke conveyor feeding into a common elevator conveyor, built at right angles to the retort-stacks. With such a length of house, it would have been impossible, or rather it would not have been economically possible, to have had a single length of conveyor running through the house, with all the wear and tear upon it, and upon the driving machinery, through its length and weight. It would have meant a useless expenditure of energy, and very considerable wear and tear, with a large amount of inconvenience when any section of the settings was let down for repairs. A comparison of the drawings illustrating the old and the new arrangement of the house will show the problem with which Mr. Goulden had to deal in order to fit new practices to conditions designed for the practices of a past day.

The results of the changes are perhaps more interesting than the character of the changes themselves. For the substantial character of the complete work, for such a weight of material as is carried and stored, and for the plant it covers (settings complete, coal and coke handling plant and hoppers, stoking machinery, gas-driven electricity generating plant and motors), the cost of the work—£73 12s. per ton of coal carbonized per twenty-four hours—is moderate. The extent of the work has, of course, a bearing on this average figure. The average labour charge, 9·31d. per ton, is also a good result, though, of course, under other conditions and other systems the figure can be, and is, beaten. The saving compared with the former equipment is a material one. It may be confidently expected, too, that owing to the reduced amount of stoking machinery, the less wear and tear upon the retorts owing to the improved mode of discharging and charging, and the enhanced heating arrangements, the cost of upkeep will be lower than formerly. Upon the low prime cost of effecting a change of this order, upon the lower labour costs, and upon the anticipated reduced wear and tear charges, there is the greater productive capacity of the house, the result of a combination of circumstances inherent and otherwise. There is the larger carbonizing capacity, the improved heating, the quicker work, and the larger charges. But that is not all. The drop from a 16-candle power standard to a 14-candle power one must take some credit for the greater productive capacity. The house as formerly equipped was only capable of carbonizing 486 tons of coal per twenty-four hours, producing about 5 million cubic feet of gas. The house as at present equipped can deal with 682 tons per day, and produce about 8½ million cubic feet. The old production divided by the old tonnage gives a make of only 10,288 cubic feet per ton. The new production divided by the tonnage gives 12,463 cubic feet per ton—a difference of 2175 cubic feet. This difference multiplied by the 682 tons represents nearly 1½ million cubic feet. It may therefore be generally said that the additional productive capacity of 3½ million cubic feet may be allocated as to 2 million cubic feet to the engineering scheme for new equipment, and as to 1½ millions to the better heating arrangements, heavier

charges, and lower illuminating power—though engineering perhaps should be given part credit for the improved heating and the heavier charge capacity. These are points, however, that we need not elaborate. The plain fact is shown by the paper that to the engineer—in the case of the Gaslight and Coke Company as in other cases—much is due for the greater economic working that has conduced to maintain and enhance commercial prosperity in the face of the bitter opposition of external and therefore uncontrollable circumstance.

To Encourage the Production of Benzol.

One of the subjects that is at the present time kept, by external circumstances, well in the minds of carbonizers, and would-be carbonizers, of coal, as well as of tar distillers, is the prospect of a large demand for highly rectified benzol for motor-car purposes. We understand that the motor-car industry and users of motor cars are exceedingly anxious to encourage, in every possible way, the production of motor spirit from the carbonization of coal, even to the extent of entering into arrangements for the protection of the home industry as against imported petrol. Price has certainly had a very large part in bringing about this attitude. The motor-car industry sees not only that the present unsatisfactory controlling conditions, which enable the price of petrol to vacillate in the most uncomfortable manner, is a bar to the largest measure of prosperity for their industry, but something more. The price of petrol has had a wonderful eye-opening effect. While its price was at a fairly reasonable level, the danger was not observed, as it has been since, of the industry having to rely almost absolutely on the importation of motor spirit; and it is recognized that all sorts of things may arise that would stop imports, and such a stoppage would be a serious thing—in fact, nowadays almost a calamity. There is a double reason, therefore, for desiring to encourage the building-up of a position that would make this country securely self-reliant in the matter of the provision of a motor spirit. To highly rectified benzol, free from sulphur, the eyes of the motor industry are turned; and the raw material lies in our own coal-fields.

Daily the motor-car industry is becoming more enthusiastic over this subject. A Petrol Substitutes Joint Committee has been formed, for the purpose of stimulating interest in the matter, and for investigating and encouraging schemes for the home production of an efficient alternative fuel for motors. This Committee consists of men of well-known names drawn from the Society of Motor Manufacturers and Traders, the Royal Automobile Club, and the Automobile Association and Motor Union. The Committee is not out for making money; it is out for a definite political purpose in connection with the motor industry, and that purpose has already been indicated. The members of the Committee are representing the buyers and users of motor spirit; and their desire is to encourage the production of petrol substitutes as—in view of the great and yet greater development of the use of motor-driven vehicles—a matter of national necessity. For the purpose of prosecuting the campaign, the Associations represented by the Committee have, at the start, set aside £1000; and this is evidence of their seriousness in what they have taken in hand. The members of the Committee fully recognize two things—the first is that, in the event of any large development of the production of suitable benzol (and they see much waste going on that could be turned to account in this direction), the market for it might be jeopardized by the counter operations of the importers of petrol; and, secondly, they are alive to the prejudice of chauffeurs who have been accustomed to petrol all their driving days.

As to the first matter. The motor-car industry is a comparatively new, but a rapidly growing, one. It already offers an extraordinarily large market for motor spirit; yet up to the present no serious attempt has been made to build-up a home industry to supply its requirements. The market is practically unlimited. Its ultimate dimensions, and its potentialities in absorption of a home-produced motor spirit, are impossible to gauge. The Associations represented by the Petrol Substitutes Joint Committee have an influential membership of makers and users, numbered by tens of thousands, all over the country; and we are assured that the members will pledge themselves to the use, over a number of years, of a suitable home-made benzol, whatever the position of the petrol market, if from the side of the producers there comes an assurance of a sufficient production, and sale at a reasonable price. A price of 11d. per gallon or thereabouts should be good enough for any car owner. If such an undertaking is forthcoming from the motor-car industry and users, it would undoubtedly be a big incentive to those in the position to produce benzol to put down the necessary rectifying plant.

With regard to the chauffeur and his scepticism as to anything ever being the equal of petrol, the interested Associations are prepared to do something in the way of educating him. As a first move in this direction, arrangements have been made to arouse general interest in the subject by having car races for money prizes at Brooklands on Whit Monday, using benzol—the cars having been previously run in races on petrol. This will be interesting; and it should help to carry conviction and to break down conservatism. Some extended experiments, we know, have been privately made in testing the relative efficiencies of benzol and petrol; and the results have shown that, with a good rectified benzol, the car mileage per gallon is, if anything, superior to that of petrol, and that, with the improvements that have made in car motors, a very slight adjustment of the air supply is all that is needed—in fact, the difference is practically negligible. But an important essential is that the benzol must be sulphur-free.

With the names before us of the gentlemen composing the Petrol Substitutes Joint Committee, we are pleased to make this statement as to the objects they and their Associations have before them in inaugurating this movement; and any assistance that can be rendered in furthering these objects will be gladly welcomed, by them and the Secretary to the Committee, Mr. Stenson Cooke, of Fanum House, Whitcomb Street, W.C.

A Government Department's Interdict.

A short time since attention was called in our columns to a matter of serious importance to the gas industry, in connection with the lighting of Labour Exchanges. A correspondent first brought the matter to our notice; his complaint being that, though an order had been given for the lighting by incandescent gas-burners of a labour bureau in the district of his gas undertaking, the order had been cancelled. A communication on the subject to the central governmental authority brought back the information that a general instruction had been given—presumably by the Office of Works, which has an Electrical Department attached—that in Labour Exchanges gas is not to be used where a supply of electricity is available. Intelligence was received from yet another source of an order for gas lighting having been countermanded; and, in this instance, the gas-piping had been pulled out, and the place wired for electric lighting. This is not only an insult to a large national industry, which contributes considerably to the revenue and well-being of the country, but—and this is the serious side of it—it is an action that is calculated to do, through its influence, irretrievable harm to that industry, quite apart from the mere lighting of the Labour Exchanges. What is also of importance is that the interdict, it now appears, applies not only to gas lighting but to gas heating. The gas industry has an undoubted right to know more about this matter. It has a right to know on whose authority the interdict has been promulgated, and the grounds—economical and otherwise—for it.

The question was once again raised by Mr. John Carter, of Lincoln, at the meeting, last Thursday, of the Eastern Counties Gas Managers' Association; and he gave testimony as to his own experience in reference to this monstrous official prohibition. Further evidence was supplied by Mr. J. T. Jolliffe, of Ipswich. There is now no doubt whatever as to the official directions that have been given concerning this matter; and, in fact, there could have been no doubt respecting it after the publication in our columns of an extract from an official communication received by a gas engineer who had made a protest against this treatment of his gas undertaking. So far, however, as we are aware, the Council of the Institution of Gas Engineers have not made any move to ascertain whether the instruction has been given on full authority, and, if so, what are the real grounds for the expulsion of gas from the labour bureaux, when gas suppliers offer to render the lighting and heating services on more economical terms (including better quality light, and more efficient heating) than electricity suppliers can offer. The matter, however, is to be brought to the serious notice of the Council of the Institution as a

result of Mr. Carter's protest and motion. Already the Council cannot be ignorant of it; and it is a somewhat singular thing if they have not before this taken steps to raise the question in the proper quarters, and to have the matter publicly ventilated. As Mr. Carter says, there is sufficient influence and authority behind the gas industry to get at the bottom of an inimical action of this kind; and there is sufficient influence and authority behind the industry to secure for it fair competitive play in its trading—if that influence and authority are only exercised in the right manner. The resolution that was passed asks the Council of the Institution to take prompt and vigorous action in an effort to suppress the prohibition; and we hope that gas managers, both individually and collectively, will support, in one way or other, the leading move by the Eastern Counties Association. A departmental ban of this kind to the detriment of one large rate and tax paying and labour employing industry for the advantage of another is not just; and that has to be made clear to the proper authorities. If they will not heed the protest, then the matter must be publicly raised in Parliament, and the customers, shareholders, and labour of the gas industry be acquainted with this governmental interference with their interests, and with free competitive trading between two large industries.

A Victim of Circumstances.

THERE has always been on our part some amount of sympathy with the ascension-pipe. It has been the seat of much trouble, it has been roundly abused for upwards of a century, and yet it is nothing more than the victim of circumstances at both ends, and of temperatures. But it is in a fair way now of obtaining release from a considerable part of the misdemeanours that have been attributed to it by ignorance in the past. The understanding of the real causes and the solution of trouble have been largely developed since the advent of the heavier charge. The heavier charge has brought several benefits in its train; and when the more profitable working results and more freedom from trouble are considered, there is almost a feeling of chagrin that the unfolding of right carbonizing conditions in horizontal retorts was such a slow process, and that waste and unnecessary trouble and labour continued so long, though the step to relieving conditions has proved to have been such a short one. It is only the due of the ascension-pipe that its position as a contributory cause of trouble in the retort-house should be placed on a right footing. Therefore, the studied case that Mr. E. G. Stewart, of the Gaslight and Coke Company, submitted at the meeting of the Southern Juniors on Friday last only amounts to an act of justice to the ascension, for the paper marshals facts of which those gas engineers who have given any serious attention to the matter have been fully aware, and which facts show that the troubles in the ascension have been mainly (though in some cases not entirely) due to preceding and succeeding conditions rather than to the ascension itself. At the retort end of the pipe, enlightenment on many points has come with the displacing of the light charge by the heavier one, using in both cases high temperatures. Considering this, and after reading the paper, we rather question the appositeness of the title selected by the author—"The Technics of the Ascen-" sion-Pipe"—inasmuch as it is to the "technics" (if we may so put it) of the conditions external to the ascension that the causes are traceable that chiefly produce certain effects in the latter. To deal with the matter here would simply be to reiterate Mr. Stewart's lucid account of the known causes, and of the fresh conditions that have been set up by the heavier charges, as well as by the better circumstances with which latter-day practices have invested the hydraulic main. There are few gas engineers who are not in the position to-day to minimize the trouble of, and to save the expense attendant upon, stopped pipes. If there are any who have not considered in detail the technical aspects of the question, then we can recommend to them a perusal of Mr. Stewart's contribution.

Outside the main subject of the causes of, and mitigating conditions for, stopped pipes, the paper deals with other pertinent matters—such as the dimensions of the ascension, and the design of the top connections and adjuncts. There is a large variety of opinion and of practice upon these points; and they are worthy of increased investigation. There is, for example, the matter of the diameter of ascensions. The diameter of the pipes should have some relation to not only the size of the retorts, but to the charge it is intended to work, to the length of the pipe, and to the circumstance whether each retort is to be equipped with one or two ascensions. It is not, of course, practicable to construct the details of retort-settings to meet exact set conditions. If it were, then even the character of the coals that are to be carbonized might constitute a factor in determining the size of the ascensions—if one could practically go into such refinement. The disparity in practice in regard to the diameter of the ascensions in relation to the work to be done is a matter that is borne in upon one who has been brought into frequent touch with it, through preparing much descriptive material of new retort installations and reconstructions. There seems to be in connection with it much haphazard selection, and little governing consideration, in some installations. Ground is found here on which Mr. Stewart or someone else could continue exploration; and we hope it will be done. In association with it, the point as to the propriety of one or two ascensions per retort is interesting. In the case of large settings—such as settings of tens—it is impracticable, on account of the deficiency of surface space, to have double-ascensioned retorts; but whether it is preferable in the case of smaller units is a matter that is well worth some further discussion. Mr. Stewart (this is not much to be wondered at) appears to be sitting on the fence in the matter. He is not very decisive on the point; and his present references to the question will permit him to descend just on that side on which the future pronounces that the weight of advantage lies. The full horizontal retort can be dismissed from consideration. There is no question that in such circumstances double ascensions are preferable. But in the case of the retorts in which a small free space is left above the charges, what of them? In large settings such as tens, as already remarked, double ascensions per retort (unless the centres of the pier walls of the arches are extraordinary and wasteful) are impracticable; in settings in which (equipped with fewer retorts) there is greater surface space, saving in capital expenditure is the dominating point with some engineers in deciding in favour of single ascensions. As Mr. Stewart says, the argument for the single ascension is that the increased speed of the travel of the gas results in extra gas yield and calorific power, but produces additional sulphur impurity. Mr. Stewart adds: "It certainly gives rise " to an increased amount of difficult matter to deal with in " the pipe; and there is at the same time no relief from " blockage."

This last remark bears upon a point made at the meeting of the Eastern Counties Gas Managers' Association by Mr. J. W. Auchterlonie in discussing the paper by Mr. Thomas Goulden, the Chief Engineer of the Gaslight and Coke Company. Mr. Auchterlonie with single ascensions has had a great deal of difficulty with stopped pipes; but, on adopting heavier charges, he has had immunity from the trouble. There has been a large amount of experience at Beckton with single ascensions; and it would be interesting to know whether, with them, stoppages there have been more or less, and also whether the quantity of sulphur compounds in the crude gas has increased. Double ascensions cannot be put in with settings of tens; but if there is a large increment in the sulphur compounds with beds containing a less number of retorts, then it becomes a question whether the saving of capital expenditure by adopting single ascensions, hydraulic mains, and other accessories, is really a saving after all, if, to give the consumer a gas reasonably free from sulphur compounds, these undesirable constituents of the gas have to be subsequently dealt with at a price. We know that Mr. J. Ferguson Bell, of Derby, has attributed to the single ascension some 20 grains increase in bisulphide of carbon per 100 cubic feet; Mr. J. W. Morrison, of Sheffield, has also spoken of an increase having been found in the gas produced in benches with single-ascensioned retorts; Mr. J. W. Helps has found the same at Croydon; and Mr. A. Caddick (who is to take the position of Works Engineer of the Company on Mr. Helps's retirement next June) has confirmed the experience.

It is a most interesting point; and it brings us to the question as to whether, in settings where double ascensions are admissible, the saving effected by single ascensions had not better be sacrificed to get a cleaner gas, and whether there is a balance of advantage in constructing beds of retorts containing as many as ten in which two ascensions per retort are impracticable. The extensive adoption of these greater retorted beds in the large works with single ascensions appears to be an effective answer; and if there is no material disadvantage in these cases, then there should

be no material disadvantage in the case of retort-houses with fewer retorts per setting. This brings us back to the experiences with sulphur compounds. With the lessened free space, the less exposure of the gas to high temperatures, its more rapid travel from the retorts (though admittedly for half of the gas a longer travel), it is difficult to see why the sulphur compounds should increase so considerably, compared with, *cæteris paribus*, the use of two ascensions—that is to say, with the same size and length of retorts, similar temperatures, and the same coals. The matter is worth inquiring into; and we are sure that the statement of experiences would be generally welcome—for the horizontal retort and its surroundings are not by any means yet in a moribund condition. When the Chief Engineer of the Gas-light and Coke Company reconstructs the equipment of a retort-house, and puts into it between 400 and 500 20-feet horizontal retorts, because local conditions favour them, there is no reason to lose interest in the details of horizontal settings. As a matter of fact, for years to come, the major part of the world's coal gas production will be derived from retorts horizontally set.

Mr. Stewart has put into a paper on the ascension-pipe more interest than, without very mature consideration, it would have been thought possible to have brought together on a detail of retort equipment. That is not the only detail in the processes of gas manufacture and residuals production that might receive similar treatment.

A Word to Burner Makers.

The modest paper read by Mr. W. Orme at the meeting of the Eastern Counties Association, mainly on the subject of inverted gas-burners, merits attention as being a record of the experiences and investigations of a practical man whose business it is to look after the interests of the customer for, and users of, burners. The point more important in our opinion than all the others to which Mr. Orme draws attention is that of the necessity for improvement in certain details of some of the inverted burners on the market. There are among inverted burners, as among other commodities, good and very indifferent ones. There are some that are cheap and flimsy, and quickly get out of order; there are others which last for years with high efficiency, and for which a fair price has to be paid. It is a matter of price largely whether a good inverted burner is obtained or otherwise. Yet there are, among the burners of good and efficient types, those that would be better still for rather more consideration to the matter of detail. It is not a good thing, for instance, to have burners the gas-regulators of which have a tendency to stick fast, or to become otherwise inoperative, or the air-adjusters of which become immovable through the excessive heating of the metal; it is not a good thing to have gas-adjusters the caps on the spindles of which (put on for the convenience of regulation by the consumers) quickly perish and drop off; nor is it a good thing to have the heads of burners so constructed that the action of the heated outflowing products on the adjacent metal of the fittings causes an eye-offending incrustation or discoloration. These are matters that should certainly be obviated by design and materials.

It is a pity these things should be; seeing that the inverted burner is the most valuable thing—both in economy and in efficiency—the gas industry has to offer for domestic lighting. If gas managers get hold of flimsily constructed and unworkable burners, it is largely their own fault through a fancy for extreme cheapness. A better price secures durability, a higher efficiency, and a saving of money in the end. Improvement in the details of some burners of otherwise excellent make ought not to be difficult to effect; and makers will do well to look through their various types and ascertain whether there are any among them that could be censured on any one score. There has never been a burner that has been put on the market that offers so much as the inverted one in connection with the future of gas supply, and that (apart from the gas economy and illuminating efficiency) gives the gas industry so much latitude in maintenance at low cost, through the ridiculously low consumption of mantles where only the best made burners are employed. The revival by Mr. Orme of the self-lighting mantle is yet another point of interest. Our experience of such mantles has not been uniformly good. If Mr. Orme has got hold of something exceptional, then he might put a name to it, so as to allow other people to enjoy its use. In these days of long-life inverted mantles, if the more expensive self-lighting mantles mean renewal (say) every six weeks or so, we shall prefer to continue giving our mantles, when light is required, the initial start in the ordinary way. Convenience can be purchased too dearly.

New Architectural Features.

Among the changes that are coming over the face of our gas-works and their operations, is that of a lighter, cheaper, and yet more tasteful appearance of the buildings. The day of the erection of heavy retort-houses and buildings for other purposes has passed, owing to the aid of the special constructions now available—such as reinforced concrete, and the "Hy-Rib" sheeting and cement concrete covering for braced steel buildings. There is no reason now why those gas engineers who have hitherto favoured a rigid design in straight lines and plain surfaces should not become converted in new work to something a little less repulsive to the eye; for the new types of construction lend themselves to betterment without material difference in cost, which is comparatively modest in comparison with that of the old-style building. It is only due to the new gas-works carbonization processes that advantage should be taken of the facility they offer for a new order of buildings, if a suitable structure is not already available. They ask for nothing but steel framing and a cover; and the clean working of certain of the new carbonization processes also suggests that the building may be provided with plenty of glazed openings for light. The photographs published this week of the new installation of Woodall-Duckham retort-settings at the Poole works of the Bournemouth Company, and of the house enclosing these settings, are peculiarly interesting. The photographs show what a light form of building is required, and how the structure lends itself to the obtaining of natural light on all parts of the contained installation, from the top stage downwards. The photographs, too, exhibit a new design of building of pleasing exterior for gas-works purposes. There is quite an ecclesiastical look about the structure (it is not suggested that this will have any good moral effect), the curve of the roof is uncommon, and one is lost to know exactly what architectural period could lay claim to the design of the building. But what matters that? It is a building very suitable to the purpose; and it helps to vary the monotonous similarity of type found, as a rule, on gas-works. Gas-works are going to be cleaner places in the future than in the past; and most gas engineers may be trusted to take advantage of every opportunity of brightening the environment of themselves and their men. It pays.

The New Retort Installation at Poole.

The new installation of the Woodall-Duckham retorts at the Poole works of the Bournemouth Company referred to in the preceding paragraph, may be taken as incorporating the very latest improving details in this system. It is equal to the carbonizing of 120 tons of coal per twenty-four hours; and the experience with it during the winter season from which we have just emerged has been so satisfactory that the Directors of the Company have determined to make a further installation equal to 240 tons per day. One point that will be particularly noticed is that this installation contains what are called "chamber" retorts; and six settings of fours carbonize the 120 tons of coal per day. This means that each "chamber" retort has passing through it 5 tons of coal per day. Another point is that three men per shift—from coal-hoppers to coke discharging—suffice. A third noticeable figure is the low power needed. The character of the coke-conveyor in its ample trench below the retorts is seen in one of the photographs. Beyond the coal and coke conveyors, the only mechanical operation is for coke discharging. For conveyors and coke discharging 9-H.P. fully meets the requirements of the plant; and of this, 1 H.P. covers the claims of the coke-dischargers. This is remarkably moderate. The work goes on day by day smoothly and without a hitch. From the photographs and description other interesting details will be gathered.

Tottenham Gas Company and Electricity Supply.

Things have been very slack at Westminster, so far as Gas Bills are concerned; there being so many of them pursuing the placid course to Royal Assent. The Gas Bill of the session—that of the Tottenham and Edmonton Gas Company—we should not be surprised before long to hear has had lifted from it all form of

opposition. Some of it has gone: and if one or two outstanding matters of not very grave import are successfully settled, there will be no local opposition. There may be a little doubt regarding the hostility of the North Metropolitan Electric Power Company, over the matter of the Wood Green electric scheme of the Gas Company. The latter have been local favourites in this matter from the first; and their scheme has aroused the Power Company into action to get the electricity supply of the Wood Green area for themselves. The first brush with the Gas Company has been before the Board of Trade, on the application of the Power Company to be authorized to carry out an electricity supply scheme in Wood Green, which scheme was not so advantageous as that of the Gas Company, to which Parliament are being asked for their sanction through the Bill. The Power Company have not been successful before the Board of Trade; so that so far the Gas Company's scheme is safe. At the moment, intelligence as to the next (if any) move of the Power Company is awaited. The Bill was read a second time on March 18; so that we ought now soon to learn whether the quiescent state in which it has been since has given the opportunity for the removal of all impediment to an uninterrupted passage through Parliament.

Gas-Stove and Pig-Iron Prices.

In the early part of last year, the gas-stove makers found it necessary, in view of the piling-up of additional costs, to make certain additions to their charges; and, as the gas-supply industry felt somewhat aggrieved over the matter, we made an independent survey of the situation, and gave the results in a dispassionately framed article. On the whole, what was then done was taken by the gas industry in the spirit in which we entered into the matter. But there were a few friends in the industry who considered that the leaning of the article was a little too much on the side of the gas-stove manufacturer. Our whole interest was one of fairness; there was nothing whatever behind it. Not even the hope of securing an additional single half-page advertisement for our columns. As a matter of fact—despite the enormous cost incurred week by week in collecting news, preparing, and publishing it from all quarters of the world, and thus supplying intercommunication between all quarters (which intercommunication has been the source from which has sprung no small part of the advance of the interests of the whole gas industry for two-thirds of a century), despite, too, the fact that this could not be done without the aid of our advertisers, who share in the prosperity of the industry—three or four of the gas-stove firms (not all of them) have, during the intervening months, advertised much below their normal rate. To those who have not curtailed their support, our thanks are due; and the others will observe our absolute disinterestedness when we point out another fact in justification for the somewhat higher prices of their goods. There are not many gas managers who are sufficiently interested in the iron trade to take careful note of prices; and there are somewhat hazy notions abroad as to what is happening in that particular market. Now the price of pig iron is really the ruling factor for all other metals; and one generally finds the prices of the latter following a course similar to the former. In the past week, the market reports tell us, pig iron has touched the highest price known since 1900, and, as a matter of fact, the prices ruling last week were some 20 to 25 per cent. higher than they were twelve months ago. We hope sincerely that this is only a temporary condition of things, as what the price of coal is to the gas maker, so is the price of pig iron to the gas-stove manufacturer.

Electric Cable Gas.

Towards the end of March, two lives were lost and property damaged through an explosion of gas in a house at Hebburn-on-Tyne. One weekly paper, with interests opposed to those of the gas industry, was in a great hurry to lay to the charge of coal gas the lamentable occurrence. Roofs with aeroplane tendencies and life destruction may serve as topics for light references in some quarters in trying to damage reputation; but it is as well to be sure of one's facts before adopting a line of derision, as sometimes the real facts turn and rend the derider. With a short memory regarding the wrecking of a Nottingham hotel, towards the end of 1911, and a matter of some thousands of pounds damage that had to be met by the Corporation Electrical Department, coal gas had forced upon it in certain electrical quarters the blame for the Hebburn disaster. But coal gas, while willing to bear blame for its own doings, was not prepared to sit under any imputation of participation in this Hebburn matter. Investigation has proved that the fusing of a cable, the resulting high temperature, and the bitumen insulation were the causes of the generation of gas, the resulting explosion, the loss of life, and the damage to property. Will the paper that referred to the matter a few weeks ago now make equally prominent amends? The electrical people tried hard to mix up the South Shields Gas Company with the trouble. They dug trenches in roads and footpaths, got permission to lay bare gas pipes and joints, made a microscopical examination in every possible direction to involve the Gas Company in the misdeeds of their own electrical cables. But all in vain. They have had to confess to an entire responsibility. One thing that has been demonstrated by this terrible occurrence is that it does not require a great fusing or much bitumen covering to generate sufficient gas to produce considerable mischief. The explosive and destructive properties of gas electrically generated from bitumen insulating material appear to be of a very high order, judging from the Nottingham and Hebburn disasters, and a few instances that we have had in London. The South Shields Gas Company were, through the energy of their Engineer (Mr. T. H. Duxbury), fully prepared with evidence. The scientific witnesses retained by them (whose evidence was not required) have made research into the composition and explosive property of bitumen gas relatively with coal-gas and fire-damp. Would it be too much to ask for the publication of the results in the "JOURNAL"? We are sure that the electrical industry would be grateful, and the gas industry highly interested.

Gas Companies and their Residual Products.

In view of the action taken by the London Chamber of Commerce, in conjunction with the Coal Tar Distillers' Association, to obtain fresh legislation in regard to the powers of gas companies to manufacture and deal in residual products, it might have been expected that the matter would have given rise to some discussion, or, at all events, have elicited some remarks, at the annual general meeting of the Chamber last Thursday. This, however, was not the case. Reference was made to it in the report of the Chemical Section, who reviewed the circumstances that led to the opposition offered to the Wandsworth and other Gas Bills which was so prominent a feature of the gas legislation of last session. The reporters quoted the clause which was inserted in the Wandsworth Bill, in place of the one originally proposed, and came to the conclusion that the combined efforts of the Chamber and the Association had been "very successful." The reporters epitomized the proceedings before the Joint Committee, but did not offer any remarks upon the decision come to. Similar reticence was displayed by members of the Chamber in regard to the whole matter. The fact may be left without comment.

The Trade Union Position.

Though the return is somewhat belated, brief reference may be made (as embracing the latest official figures available) to Part C. of the reports of the Chief Registrar of Friendly Societies for the twelve months to Dec. 31, 1911. This was issued a few days ago, and contains statistics showing the position of trade unions at the end of that year, as compared with 1910. It is believed that only about one-half of all the trade unions in existence are registered, though it is estimated that the membership of the registered unions represents about 80 per cent. of the total membership of trade unions in the United Kingdom. The partial nature of the office records with regard to trade unions is, of course, regarded as unsatisfactory from a statistical standpoint. At the close of the year 1911, there remained upon the register 680 trade unions; and of these 648 supplied returns for the twelve months. The total membership of these 680 unions was 2,378,957, which (taking into account certain adjustments) represents an increase on the previous year of about 500,000. The only union which showed any considerable decrease in membership was the South Wales Miners' Federation, to the falling-off in which reference was recently made in these pages. The total income of the unions was £3,679,588; the average contribution received from each member being £1 7s. 6d., and the average benefit paid per head 19s. Thus about two-thirds of the amount paid by members was returned to them in benefits. "Dispute benefits" represented about one-sixth of the total income—being exceptionally heavy as compared with the four preceding years.

The funds of the registered unions at the end of 1911 amounted to £6,326,712, which was an increase of £454,872, or 7·75 per cent., on 1910. In this connection, it may be stated that the mining and quarrying and engineering groups between them hold more than half the total funds of the registered unions. The average accumulated funds per member of all the unions was, at the end of 1911, £2 13s. 7d. This was a substantial decrease, owing to the large increase in members, which was, of course, not accompanied by a corresponding increase in the accumulated funds. The largest increase in membership of any individual union in 1911 was a gain of 44,849 members by the National Union of Gas Workers and General Labourers.

A Big Request.

It is not necessary to follow very closely or for very long the proceedings of those who discuss local government matters, in order to ascertain that there is a widespread feeling of discontent on the subject of Exchequer contributions in aid of national and semi-national services performed by local authorities. The substance of the complaints is that, while the work of these bodies is steadily growing more national and less local, there is continued delay on the part of Parliament in making anything like suitable and adequate provision for meeting the additional and constantly increasing outlay on services of a national character which the local authorities are consequently called upon to incur. The grievance is, of course, an old one, but changing conditions make it more and more heavily felt as time goes on. A conference of representatives of county councils and corporations was held in London last week, at which the arguments in favour of further Exchequer contributions were voiced. The gathering took place two days after the Chancellor of the Exchequer had made his budget speech—which was a pity, inasmuch as one of the resolutions unanimously carried urged upon the Government the imperative necessity, pending fresh legislation or general re-adjustment of local and imperial taxation, of "making immediate provision for an interim payment of at least the £2,500,000 recommended by the Royal Commission on Local Taxation by way of annual addition to the Exchequer contribution account towards the cost of the public services discharged by local authorities." Perhaps the request will be borne in mind when the estimates of national expenditure for the ensuing year are being considered!

PERSONAL.

RETIREMENT OF MR. JAMES W. HELPS.

THERE will, we are sure, be a widespread feeling of regret at the announcement we make to-day that, owing to considerations of health, Mr. James W. Helps has found it necessary to relinquish, as from the 30th of June next, the position he has long held as Engineer and General Manager of the Croydon Gas Company. Mr. Helps, it may be remembered, has on several occasions, during the last few years, been compelled to seek temporary relief from his duties; and the Directors have, in the most sympathetic manner, facilitated the taking of rest and change, which it was hoped would tend to re-establish his health. From one of these periods of rest he returned not many weeks ago. He was present at the last half-yearly meeting of the Company, and the Chairman (Mr. Charles Hussey) expressed the pleasure felt by all in seeing Mr. Helps again with them. He was not, however, in such robust health as they could wish. Unfortunately, the strength he had acquired did not continue, and the step he has taken was the consequence.

In acknowledging a vote of thanks on the occasion just referred to, Mr. Helps stated that he had completed thirty years' service with the Company. Since he came to them from Weston-super-Mare, what changes have occurred in the undertaking. Under his supervision, the works have been greatly enlarged; and two neighbouring companies have been amalgamated. The value of his service to the Company has been acknowledged from the very first; and it has now been recognized in a tangible way by the granting to him of a suitable retiring allowance.

The resignation of the Company's Engineer and General Manager has necessitated some changes in the staff. One of Mr. Helps's latest public utterances in connection with the Company was a recognition and appreciation of the loyalty of his Chief Assistant, Mr. Archibald Caddick, during his enforced absence; and he congratulated him on the "splendid work he had done." Mr. Caddick has occupied his present position for about fifteen years; and he has been fittingly chosen to hold the higher one of Engineer and Works Manager. Mr. W. J. Sandeman, who has for nearly ten years been in charge of the Distribution Department, will become Distributing Engineer and Sales Manager. Yet another change will be in connection with the office; Mr. William W. Topley, the Secretary, receiving the title of Secretary and Accountant.

In the thirty years during which Mr. Helps has resided at Croydon, he has laboured hard, not only for his Company but for the gas industry at large. As president, secretary, member of committees, organizer—wherever work was to be done, Mr. Helps was ready and willing to do it. If a monument to his industry is required, it will be found in the volumes of "Transactions" of the various Gas Associations. He is now compelled to rest from his labours; but in his retirement he will be justified in reflecting that he has done something to broaden the base and strengthen the foundation of the great industry with which he has been associated.

Mr. J. P. HALLAWAY, the Engineer and Manager of the Singapore Gas-Works, is on his way to Europe on leave of absence. He left Singapore on the 4th inst.

We learn that the Directors of the South Metropolitan Gas Company have appointed Mr. J. S. G. THOMAS as Research Physicist to undertake investigations for technical purposes.

Mr. H. A. DICKINSON, of the Colne Corporation Gas-Works, has been appointed Engineering Assistant on the technical staff of the General Manager (Mr. R. W. Edwards) at the Ash Road works of the Aldershot Gas, Water, and District Light Company.

Mr. MICHAEL J. BUCKLEY has been chosen by the Dublin Corporation to fill the position of Borough Surveyor and Water-Works Engineer rendered vacant by the death of Mr. J. G. O'Sullivan. He entered the Corporation service early in life, and worked with the Drumcondra Commissioners until 1900, when he was appointed Engineer to the City Improvements Committee.

Among the associate members of the Institution of Civil Engineers who have been transferred to the class of member, as shown by a recently issued list, are Mr. A. E. CORNEWALL-WALKER, of the East Surrey Water Company, Mr. C. H. RUTTER, of the Brighton and Hove Gas Company, and Mr. ARTHUR VALON, of Westminster. The transfer of the last-named gentleman was notified in the "JOURNAL" a fortnight ago. Mr. ARTHUR TRADEWELL, of the Water Engineer's office, Nottingham, has been elected an associate member of the Institution.

At the Lewes Gas-Works, on Monday last week, the employees assembled to bid farewell to two of their number who were leaving for Canada. One was Mr. A. E. JONES (son of the Manager, Mr. E. Jones), who has been Assistant to his father for six years, and the other Mr. R. E. BENNETT, who had been a fitter in the Company's service rather more than nine years. They were each presented by the Manager with a case of pipes, subscribed for by their fellow-workmen, who wished them good fortune. The two young men sailed from Southampton next day.

The retirement of Mr. WILLIAM DRORY from the Board of Directors of the Frankfort Gas Company is announced. In reporting this fact, the "Journal für Gasbeleuchtung" gives the following details of Mr. Drory's career: "Born in December, 1835, he entered the service of the Imperial Continental Gas Association in 1853 at Lille. In December, 1860, he took over the management of the Company's works in Frankfort-on-Main. His work and activity in this connection are too well known to require detailed reference on this occasion. On the agreement made in 1905 between the Imperial Continental Gas Association and the Frankfort Gas Company, Mr. Drory was placed on the Committee of Supervision, and in 1909 he took his seat on the Board of the newly-constituted Frankfort Gas Company. Meanwhile the gas supply of Frankfort has been making big strides under his management. His activity and cheerful disposition have accompanied Mr. Drory even to his advanced age; and, his day's work done, we would wish him all happiness in the evening of his life."

OBITUARY.

A number of members of the gas profession will, we are sure, unite with those assembled at the meeting of the Eastern Counties Gas Managers' Association last Thursday in expressing regret at the removal by death, at the early age of forty-seven, of Mr. FREDERICK C. SUGDEN, of Messrs. F. C. Sugden and Co., of Leeds, who was a familiar figure at similar gatherings. Deceased was formerly associated with West's Gas Improvement Company, Limited; but some years ago he commenced business as a gas engineer and contractor.

We regret to announce the death on the 20th inst., at his residence in Wadham Gardens, Hampstead, N.W., of Mr. TROTMAN FOSTER, the senior partner in the firm of Messrs. E. Foster and Co., colliery owners, of 21, John Street, Adelphi, and Chairman of the Pelaw Colliery Company. Deceased had been a partner in the firm for more than forty years, and was well known to a very large circle of friends connected with the gas industry, by some of whom probably he will be remembered in his capacity of first Secretary to the Metropolitan Gas Referees, appointed under the City of London Gas Act of 1868. The earlier reports of the Referees were signed by him, and some were issued from the address given above. Mr. Foster was in his seventy-second year.

The death has lately occurred of Mr. COLIN CAMPBELL SIMPSON, the Assistant-Secretary and General Superintendent of Mains of the Consolidated Gas Company of New York. He was

at his office, apparently in good health, only three days before his death, which followed an operation. Mr. Simpson was born at Maidstone, and left England for the United States about thirty-five years ago. From the time of the organization of the Consolidated Gas Company of New York in 1884, he had been in charge of all important engineering work, including the laying of mains under the Harlem River in three places. This work was described in a paper which he prepared for the American Gas Institute during the presidency of Mr. W. H. Bradley, the Chief Engineer of the Company. [The paper was given in the "JOURNAL" for Jan. 24, 1911, p. 221.] Mr. Simpson was also in charge of all work in connection with the care and alteration of mains during the construction of the New York subways. He was fifty-six years of age, and leaves a widow and three children.

ELECTRICITY SUPPLY MEMORANDA.

OUR weekly contemporary bearing the proud title of "Truth," has published its first "Electrical Supplement," and, for so doing, has been rewarded by the advertisements of several firms supplying domestic electrical appliances. The

Electrical Supplements.

advertisements are the least objectionable part of the supplement; but what of the literary foundation for the rewarding advertisements? To those of us who have seen so much of this sort of thing from electrical sources, the matter is nothing more than dressed-up antiquity, which has time and again been made use of by the electrical industry in their literature. We can put hands on prior publication in which, in different direction, most of the same statements have appeared. Many of them have grown shabby and worn with age, as well as ineffective through repeated use. We anticipated that "Truth" would have hit upon something more original, and that it would have been just in its new departure, and confined itself to truth. The time-honoured statements as to the advantages of electric lighting and other household electrical applications are all there; the scientifically supported disadvantages, and those proved by practical experience, where are they? It is very amusing to find that "Truth" has not been able to ascend higher than it has done in this first "Electrical Supplement." We get the old story as to the discoloration of ceilings from gas use, which has come down to the present from the historic days of flat-flame gas-lighting. Nothing is said as to the perfect combustion to be realized by the modern inverted gas-lamp. Nothing is said as to the far more important demerit of electric lighting—its capacity through its defective spectrum quality, and greater intrinsic brilliancy than the incandescent gas-light, to do incomparably more harm to the eyesight than the modern gas-burner. We again read of the vitiation of the atmosphere. What with? And of that childish prattle about "economizing the amount of oxygen available for human consumption in a room." So insult upon insult is poured by "Truth" upon Nature's beneficent provision for the utilization of her gifts; insult upon insult is levelled at the intelligence of "Truth" readers; and all for what purpose? To obtain for the electrical industry the custom of those people whose education is sufficiently deficient to permit them to swallow as truth that which is not true. There is, of course, once more in print but not in fact an increased safety and immunity from fire by the use of electricity. Readers of "Truth" are very likely people to know something of the loss of life and property that has occurred through electrical causes. The writer of the article has been either blind to these things, or has conveniently forgotten them. He also tells his readers that electricity at 5d. per unit is cheaper than gas at 3s. per 1000 cubic feet. But he takes good care not to supply the basis for this example of profound absurdity. There are also samples of those old electrical indirect attacks upon gas heating contained in such statements as that electric heating does not rob the air of its oxygen, or contaminate it with deleterious products. Does the writer imagine that the public, with its large experience, is now going to accept these ancient commonplaces, which had circulation long before gas heating obtained such a measure of popularity as it has received, and is increasingly receiving? Incorporated, too, in the article are the oft-told stories concerning electric cooking; and an acquaintance of very familiar face is the table showing the relative weight of meat to be bought at the butcher's according to the method of baking—by gas, coal, and electricity. The figures assert that a less weight of meat is required when electricity is to be the cooking agent. Why this is supposed to be so is not explained. Given equal temperatures, equal cooking time, equal weight of meat, meat of the same constitution, and cooked to the same degree, perhaps "Truth" will tell its readers why, in its sage opinion, the gas-oven, under these conditions, should require a heavier joint than the electrical oven, to yield the same weight of cooked meat. Reference is also made, as it has been made hundreds of times before, to dear old Mrs. Beeton's cookery book. It is all very paltry; but that the use of the same paltry ineffective arguments is lasting and unvariable, is a source of supreme gratification to the gas industry. The public now knows them well; and the public is not agitated thereby. The "Standard" has also just commenced articles on "Electricity in the Home." But if we think so lightly of "Truth's" first performance in this line, we had better refrain from saying anything about an effort which is rather below the electrical standard in this particular.

The Confession.

The "Electrical Times" has made a confession. As readers of the "Memoranda" are aware, "Meteor" of that paper has been talking at random lately, and yet in a dogmatic sort of way, about the relative heating efficiencies of gas-fires and electric-radiators. With a boldness due (as boldness frequently is due) to lack of personal knowledge, he derided the results of the extensive scientific experiments that have been made at the Leeds University and elsewhere to ascertain the heating efficiency of the modern gas-fire; and he asserted, and repeated and emphasized the assertion, that "the efficiency of the average gas-fire, in heat given off usefully in the room, is below 20 per cent. of the theoretical heat units in the fuel." The ridiculous statement applied to a gas-fire of current times was a sufficient confession of want of knowledge. However, to give "Meteor" an opportunity of making a further display of ignorance on the subject, we asked him to give us some information as to the scientific methods by which he had arrived at such a definite conclusion, and to produce a gas-fire of modern make that has a heat efficiency as low as 20 per cent. Those electricians who read the "Memoranda" will have observed that "Meteor's" courage has not been equal to facing this matter. Before that happened, the "Electrical Times" had stated that the electric radiator gave something like 30 per cent. of its heat in the radiant form, and the bulk of the remainder as convected heat. It afterwards dawned upon our journalistic friends, that the bulk of the heat given off by the electric "radiator" was of the wrong brand, and endowed that form of heater with the greater title to be known as a convector. With easy conscience, the order of merit was reversed; and, in a subsequent issue (as we pointed out last week), the electric radiator was invested with all the glory of a 75 per cent. radiant efficiency, and about 25 per cent. only of convected heat. Mr. C. Orme Bastian has drawn a confession from our contemporary. He inquired whether the statement that the lamp type of heater emits 75 per cent. of its energy as radiant heat was capable of demonstration or confirmation; and, if so, how? The editorial reply is: "We acknowledge ourselves unequipped by any experiments personally conducted. When one suffers from such an omission, the only thing is to follow those who claim to have first-hand knowledge of the kind; and we *think* that we could refer our correspondent to several authorities who would accept responsibility for approximately the same percentages." The guarded character of this statement was further maintained by not quoting the names of the "several authorities." Therefore, perhaps our contemporary, in its own support, will now furnish them, so that we may inquire of the "several authorities" by what means they arrived at the efficiencies mentioned, and the types of "radiators" upon which their experiments were made. With that knowledge, experiments can be instituted to check their conclusions. At the same time, as the "Electrical Times" has not made experiments on electric radiators, it may be concluded that it has not made experiments on gas-fires; and as "Meteor" is so positive that a gas-fire only gives off in useful heat "below 20 per cent. of the theoretical heat units in the fuel," perhaps the names of the authorities for his misplaced confidence in this regard will also be given, in order that proper investigations may be made. Meantime the readers of the "Electrical Times" had better preserve a little reserve in accepting as true all that our contemporary has to say on this subject.

The Sit-Still Policy.

An article on the question of the "Development of Electric Cooking" has been published in "Electrical Industries;" and it shows that the electric cooking situation verges on the chaotic, but submits as a fact that the stage is being rapidly approached at which it will be possible to standardize electric cooking apparatus. There is one thing of which we should like to clear the mind of the writer of the article; and it is that the electrical people are not the only ones "behind the scenes" in this matter. Managers of gas undertakings are also in a very favourable position to hear the disinterested views on the subject of erstwhile users of gas-stoves who have gone over to electric cooking, and, for their own peace and satisfaction, have again had a reliable gas-stove installed. We make this statement from knowledge of what has occurred in certain towns, and as a reply to a passage in the article that "the gas journals may pretend that electric cooking is a kind of make-believe, but the managers of gas undertakings are under no such illusion." The fact of the matter is that in some districts, there has been just a sufficient length of experience with a few isolated electric cookers in private dwellings to cause the users to know that, apart from uncomfortable cessations of the supply of the necessary energy due to external causes, there are, despite the frequent attentions of experts, manifold seats of fault about the electric-cooker itself. The reliability of the older method of cooking, and the wide range of service of the gas-oven, intensify the dissatisfaction created by experience with the electric-cooker. In the same article, it is submitted that "the gas interests would not take so much trouble to create prejudice against electric cooking if it were anything like so bad as the letters of the British Commercial Gas Association make out." That is choice, after the scandalous attacks that

have been made on the gas-cooker as part of the electric-cooker propaganda. There is advice concealed in the expression of view of the writer of the article that "all that would be necessary if electric cooking were so costly, dangerous, and unreliable, would be to wait till people found it out, and were ready to revert thankfully to gas." That is not the usual way of competitive trading. The commercial men of the gas industry are not prepared to sit still, and see any of their customers misled, and gas-stoves removed, in order to gain the experience which has resulted, within the last year or two, in gas-stoves being replaced. Someone has to pay for this, and that someone must be the customer, if it is through his own action the gas-cooker was removed in the first instance. It is not the duty of the gas industry to sit idle under the circumstances. We know intimately of a town where there were a number of electric-cookers installed, and hardly one of them is in use to-day. The greater proportion of them are still standing in the consumers' houses, but not far from each of them is the gas-stove, which has preferential use. The electric-ovens remain as novelties, and as testimonials to their purchasers' or hirers' (under agreement) credulity. It is admitted in the article before us that "several cases of disappointment have occurred;" and unkindly it is added, "the gas companies are making *more than* the most of them," which seems a sort of superhuman task. It is to protect consumers of gas for cooking purposes against a greater extension of this "disappointment" than personal foolishness brings about that the gas industry opposes the methods of the electric cookery propagandists, which methods contain that which is both untrue and slanderous. We may ask the pertinent question, as the reverse of what the writer of the article says: Why take notice of what the gas industry is doing if all the virtues are on the side of the electric-cooker? If these virtues are genuine, then the ultimate supremacy of the electric-cooker is assured.

Power.

Put on one side for convenient notice is a paper read a few weeks ago, by Mr. W. E. Milns, before the Birmingham Section of the Institution of Electrical Engineers. It was on the subject of "Economies in the Use of Electric Power." Among the ingredients of the paper are found candour and inconclusiveness, as well as points upon which there is agreement with the author. There is concurrence with his opinion that the commercial canvasser who, lacking any technical knowledge, possesses those qualities of salesmanship which enable him to get motors into consumers' premises, is a dangerous person to employ. There is acknowledgment, too, that the electric drive is not the best for all circumstances. That is what we have been saying for a long time past; and we have never been so foolish as to declare that there are not circumstances in which the electric drive is not more convenient than any other. The non-technical canvasser, says the author, "is not able to discriminate between those jobs which are suitable and those which are ill-adapted for the electric drive; and he cannot recognize the importance of keeping certain power installations off the mains." In other words, it is admitted that the electric drive is not qualified for universal application, and that there is some power custom which is not desirable. But when we come to comparative costs, the author is less satisfactory. He speaks of the "crude methods of comparison between gas and electric driving." But, like his kind from their origin to the present, he does not say in what way they are crude. He states that the power user is commonly told—apparently by the gas man—that a (say) 10-horse power gas-engine takes 20 cubic feet of gas per horse-power-hour. On a 50-hours per week basis, this works out at 10,000 cubic feet of gas, which, if charged at 1s. 6d. per 1000 cubic feet, equals 15s. On the other hand, the customer is informed that a 10-horse power motor consumes approximately 1 unit per horse-power-hour, which is equivalent to 500 units per week. Taking current at 1d. per unit, the customer is told this works out to 41s. 8d., against 15s. for the gas-engine. Now for a brake horse-power-hour a modern gas-engine will only require 16 to 17 cubic feet per brake-horse-power hour; so that Mr. Milns is generous in accusing gas men of a broad-mindedness in not cutting their claim too fine. In the matter of the unit, too, per horse-power-hour for electric motors, the gas man takes in his comparisons about 750 watts per brake-horse-power-hour. What the author has to complain about in this, it is difficult to see.

Evasion.

However, he goes on to depreciate the knowledge of the manufacturer, and to advise a process of evasion in dealing with an inquiring manufacturer. "When," says Mr. Milns, "a manufacturer asks for the cost of electricity per horse-power-hour, and says that such a figure will enable him, with his own knowledge of his work, to estimate his costs, *it is wise to ignore the question.*" Manufacturers will, on their part, be wise to mark the evasion. The reason Mr. Milns gives this advice is because he does not place any great value on the brain power and knowledge of the manufacturer. "The manufacturer," he says, "has a very vague idea of horse power, is ignorant of both his maximum and his average load, and cannot estimate his horse-power-hours." This being so, how can a better method of estimating the cost of driving be based upon figures actually obtained from "existing manufacturers' installations?" The "existing" appears to be misplaced. The author then proceeds to give a few comparative figures, which he says have been obtained from actual working, in which, naturally, the electrical figures all come out lower than gas or steam. Mr. Milns would not have included them had the reverse been the case. But of what value are they? There is no information showing the elements that go to supply a comparable basis. The relative cost of gas and electricity is not given; and the hours of use, loads, outputs, and all else are missing. This seriously detracts from the value of the paper. No doubt Mr. Milns knows, as well as we do, that the manufacturers are not few in number who have returned to gas for driving because they have found it, under their circumstances, cheaper and more reliable. Among some pseudo-philosophic remarks with which the paper concludes, Mr. Milns says: "Practically in no case is steam or gas called in to improve the lighting, cleanliness, or ventilation of works." Earlier in the paper, the author refers to the "vague ideas" and "ignorance" of the manufacturer in forming judgment as to power costs. If he reconsiders the construction of the sentence just quoted, and at the same time extends his knowledge of the business affairs of the gas industry, he will find that, at the time he wrote his paper, there existed one other person besides manufacturers who possessed "vague ideas" and was "ignorant" in certain respects. There are numerous examples of the lighting, cleanliness, and ventilation of works having been improved by modernizing the gas arrangements.

Laundry Irons.

Touching another industrial subject, there has been much lament that, at the recent Laundry Exhibition, the use of electric-irons was not more effectually demonstrated. There are laundrymen who have had some experiences they do not want repeated through the use of electric-irons; and Mr. G. Scott Ram, the Chief Electrical Inspector of Factories, had to specially call attention to their danger in one of his annual reports. In the electrical papers, too, there have been, from time to time, complaints as to the unreliability of these irons. A correspondent of the "Electrical Review," who unkindly signs himself "Ironical," pleads for information from any of the readers of the paper who have had the good fortune to discover a practical electric-iron for laundry or factory use. He declares that he has tried "all" the "well-known" makes, but cannot find one that will stand-up without attention for more than three months. The chief difficulty is the disintegration of the copper of the flexible (flexibles Mr. Scott Ram does not approve of) close to the connector terminals, due to the heat rising from the iron, which also destroys the rubber on the flexible, and causes short-circuits. Another fault with most irons is the way the connection is made between the heating element and the brass terminal pins. This is, as a rule, very crude, and has not the attention bestowed upon it which it deserves, the result being arcing, and eventually an open circuit. Following the letter of "Ironical," another appeared from Messrs. Lester and Folwell, of Leicester. These correspondents, too, have had considerable experience in electric domestic and laundry irons, and have tried *all* the well-known makes, but cannot find one that will give satisfaction for any length of time. The troubles experienced by them are either the copper contact (which seems to lose its nature by the close proximity of the heat) loosens inside the iron from the element, or the pins connecting the cable connector lose their tension, and have to be constantly renewed. The flexible wire close to the connector in a short time frays, the rubber perishes, and short-circuits occur if the subjects of these defects are not attended to periodically. Household electric-irons are run at lower temperatures, and have intermittent use; so that trouble with them is not so frequent as in the case of irons that have heavy and continuous use in laundries.

End of the Strike in Belgium.

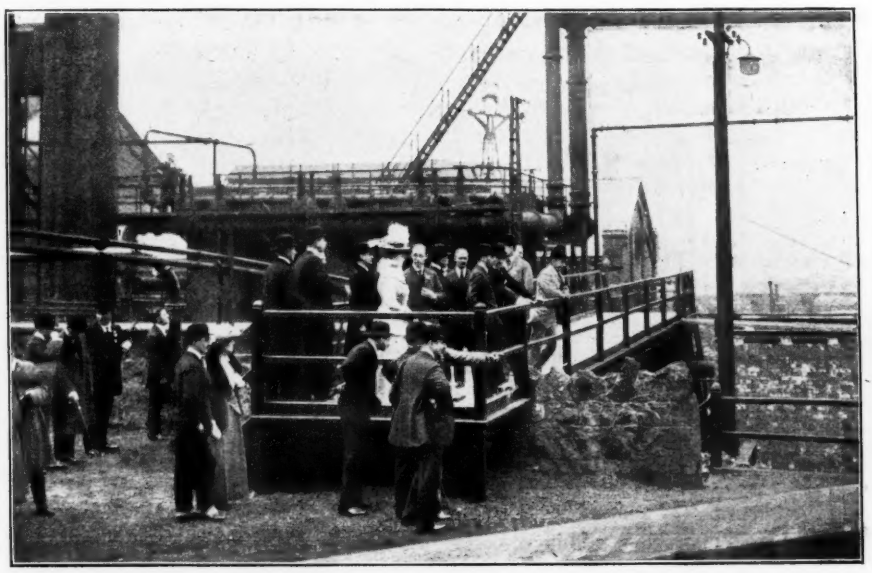
Readers will have seen from the papers that, as a result of a decision in the Belgian House of Representatives, the Socialist Congress decided that the recent strike should end and work be resumed. As regards the gas industry, we learn that there was no trouble whatever with the men at the works or in the outdoor department of the Imperial Continental Gas Association in Brussels, though the Socialists did their best, by means of meetings, &c., to keep the men away from their duties. This, however, was not the case at the works of the Municipality and those of the commune of Saint-Gilles, one of the suburbs of the city, where there was some difficulty. Among other things, the lamplighters went on strike, and they had to be replaced by whatever men could be procured; and this, of course, caused some disturbance in the service.

The H. Koppers Company of Chicago have obtained a contract for the new bye-product coke and gas oven plant for the Laclede Gas Company, at St. Louis (Mo.). It is stated that this will be one of the most complete gas plants in the world.

Mr. Francis Jones Heseltine, a Director of the South Barracas (Buenos Aires) Gas and Coke Company, Limited, left estate of the gross value of £50,615, of which net personalty has been sworn at £50,211. An unusual feature of the will is a number of bequests to Westminster Palace Hotel servants.

At the ordinary meeting of the Society of Engineers on the 5th prox., a paper on "Tidal Waters as a Source of Power" will be read by Mr. C. A. Battiscombe. The author will deal with the commercial possibilities of hydro-electric installations in the British Isles, with special reference to the use of the tides, give a rough estimate for an installation, and endeavour to show that the carrying out of such a project would be a gain to commercial and industrial interests.

ROYAL VISIT TO THE BIRCHENWOOD COLLIERY.



Photograph showing their Majesties inspecting the discharge of coke from the Carvès ovens. The background is made up of Still plant condensers and scrubbers. Colonel Heath is explaining to the King, and Mr. W. H. Heath to the Queen, the working of the machinery.

In view of the full illustrated description of the Birchenwood colliery and coke-oven and bye-products plants which appeared in the last issue of the "Journal," it is interesting to record the fact that a visit was paid to the colliery by the King and Queen last Wednesday. Their Majesties accepted specially prepared books from the Directors, giving an account, with illustrations, of the colliery and the North Staffordshire coal trade. Lord Dartmouth introduced the Chairman of the Company (Colonel Heath) to their Majesties—he, in turn, introducing his co-Directors and the chief officials. In all, thirteen gentlemen were presented: Colonel A. H. Heath (Chairman), Sir James Heath, Bart. (Director), Mr. W. H. Heath (Director), Mr. R. A. Heath (son of the Chairman), Mr. James R. L. Allott (General Manager), Mr. F. J. Mason (Secretary), Mr. N. R. H. Macgowan (Colliery Manager), Mr. Jeremiah Malbon (Colliery Under-Manager), Mr. Joseph West (Manager of the Simon-Carvès coking plant), Mr. D. V. Hollingworth (Manager of the Carl Still coking plant), Mr. T. D. Young (Manager of the Mond gas plant), Mr. John Steele (Engineer of the Colliery), and Mr. Samuel Ball (Foreman Carpenter).

Subsequently their Majesties proceeded to inspect the discharge of coke from both the Still and Carvès ovens. Afterwards, the "Still" exhauster-house, benzol-house, sulphate of ammonia manufactory, and the carbolic plant were examined. Their Majesties exhibited great interest in the various operations and plant—especially in the production of pure benzol for motor purposes. Both the King and the Queen particularly examined the exhibit of products obtained from coal and tar.

GAS AT THE NURSING EXHIBITION.

The striking success that has been achieved by the commercial staff of the Gaslight and Coke Company, in their work of enlisting the active support of the medical profession on behalf of gas as a hygienic method of obtaining light and heat, is matter of common knowledge. The campaign has been a persistent one; and naturally, in view of the thoroughness that always characterizes the Company's methods, the nurses have not been forgotten. Indeed, in matters of hygiene, the goodwill of medical nurses is of great importance. Each year a fine opportunity of gaining the consideration of nurses in the matter of the advantages of gas in reference to health and convenience presents itself, in the Nursing Exhibition and Conference; and there the Gaslight and Coke Company have been careful to be represented. The benefit of so doing is not, of course, confined solely to their own district. Professional duties take nurses from one place to another, and, besides, they come from all parts to an exhibition which appeals so closely to them as this. Thus they go away sowing in every direction the good seeds of what they have learnt there. Last week there was held in the Royal Horticultural Hall, Vincent Square, S.W., the sixth of the series of these annual exhibitions; and the Company made an even more imposing display there than usual. In fact, it is not too much to say that their show was one of the features of a first-rate exhibition. One of the annexes, measuring about 40 feet by 20 feet, was entirely taken up by them; so that they had really quite a little exhibition of their own—and one which was visited by many hundreds of nurses each day. During one hour on Thursday evening, the display was inspected by no less than 280 of them.

One point deserving of mention is that the whole of the work connected with the exhibit was done in three days—including the provision of hot and cold water supplies, and waste pipes to the different points. There were hundreds of feet of piping; and every pipe that could be hidden was out of sight. Entering the annexe, the visitor stepped into a handsomely appointed bedroom, the furniture for which was lent by Messrs. Maple and Co. The fire was one of Messrs. John Wright and Co.'s newest patterns—"The Times"—and was provided with a bronchitis-kettle. The fire, as was the case with everything shown, was in action, so that the stand was "alive" in every particular. In one corner was a Ewart "Brilliant" geyser, with spray; and there was also a nickel plated towel-dryer by the same firm, provided with three rails, and heated by an atmospheric burner consuming about 6 cubic feet of gas per hour. The "Nico" wall lights (with their beaded shades) were operated by Messrs. W. Sugg and Co.'s new pneumatic switch, which is provided with a bye-pass, and the battery for which is fitted at the operating point.

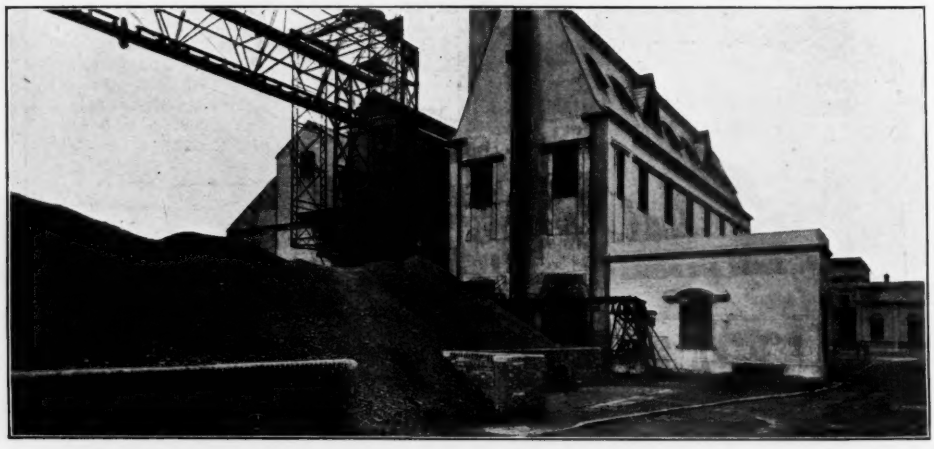
The other side of the annexe showed a kitchen and bath-room. In a recess in the former were a Potterton "Victor" boiler and one of Messrs. Wilsons and Mathiesons' "Advance" cookers, by means of which invalid cookery demonstrations were made by Nurse Nethercotte, who, being a trained nurse, was able to put matters before her professional visitors in a convincing manner. A Davis "Minerva No. 2" fire, with a Larkin boiler, and side burner, was also shown; and there was a goodly array of culinary utensils, provided by Messrs. Still and Son. Altogether, the exclamation "What a beautiful kitchen!" which the writer heard one lady visitor make was completely justified. The walls of the bath-room were covered in "Emdeca;" and there were to be seen there a Ewart "Lightning" geyser, and a Wright gas-steam radiator, with a new pattern towel-rail so fixed that it might be moved from one side to the other. Here was also a lavatory basin supplied with hot water from the Potterton boiler.

The general lighting was well effected by four Sugg and four Podmore three-burner high-power low-pressure lamps. The former were lighted and extinguished by switches, and the latter on the "Telephos" system. The Sugg switch, it may be pointed out, is in two forms. One has already been alluded to; and the other, which was also shown, is provided with separate pushes for turning the light on and off, so that no mistake can be made. There was no crowding anywhere about the exhibit—unless it was in the matter of visitors; and in the central space a number of chairs were provided, which were conducive to a full study of all that was to be seen. Considerable interest was aroused by a Forbes patent water sterilizer—an apparatus which has been designed to boil water and then quickly cool it, in such a way that the operation does not alter its taste, while rendering it absolutely safe for drinking purposes. It is stated that 15 gallons of water can be sterilized with this apparatus for an expenditure of only 1d. for gas. It is made in many sizes; the largest being of a capacity of 350 gallons per hour. A "Vogel" gas-operated ventilating fan, working on a small gas consumption, was in action, as well as a portable sterilizer for surgical instruments. Finally, in the "writing on the wall" were emphasized many good points in connection with the use of gas.

WOODALL-DUCKHAM VERTICALS AT THE POOLE WORKS

Of the Bournemouth Gas and Water Company.

THE accompanying reproductions of a series of excellent photographs show the general lay-out and details of an installation of vertical retorts on the Woodall-Duckham system which was erected at the Poole works of the Bournemouth Gas and Water Company, and put to work in the autumn of 1912. The installation consists of six settings, each of four "chamber" retorts, giving a total carbonizing capacity of 120 tons of coal per 24 hours. It is housed in a braced steel building, covered on the outside with "Hy-Rib" sheeting and cement concrete. This form of construction is very light, and can be made to present a really pleasing outside appearance.

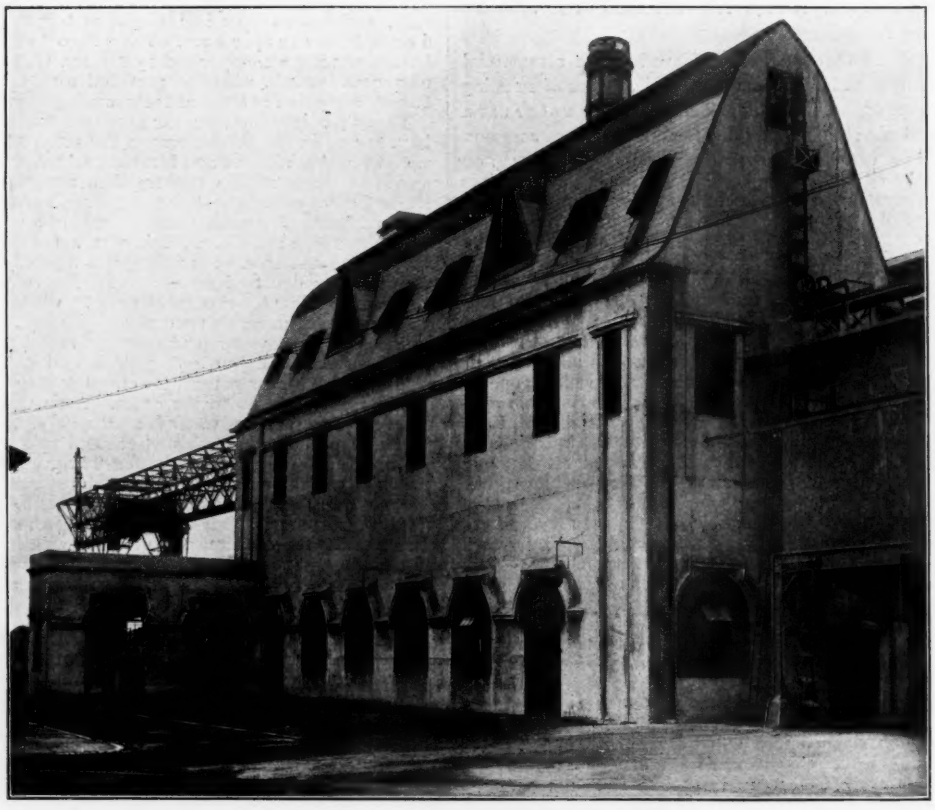


GENERAL VIEW OF THE RETORT-HOUSE, SHOWING THE LAND-END LEG OF THE TEMPERLEY TRANSPORTER AND CONVEYORS.

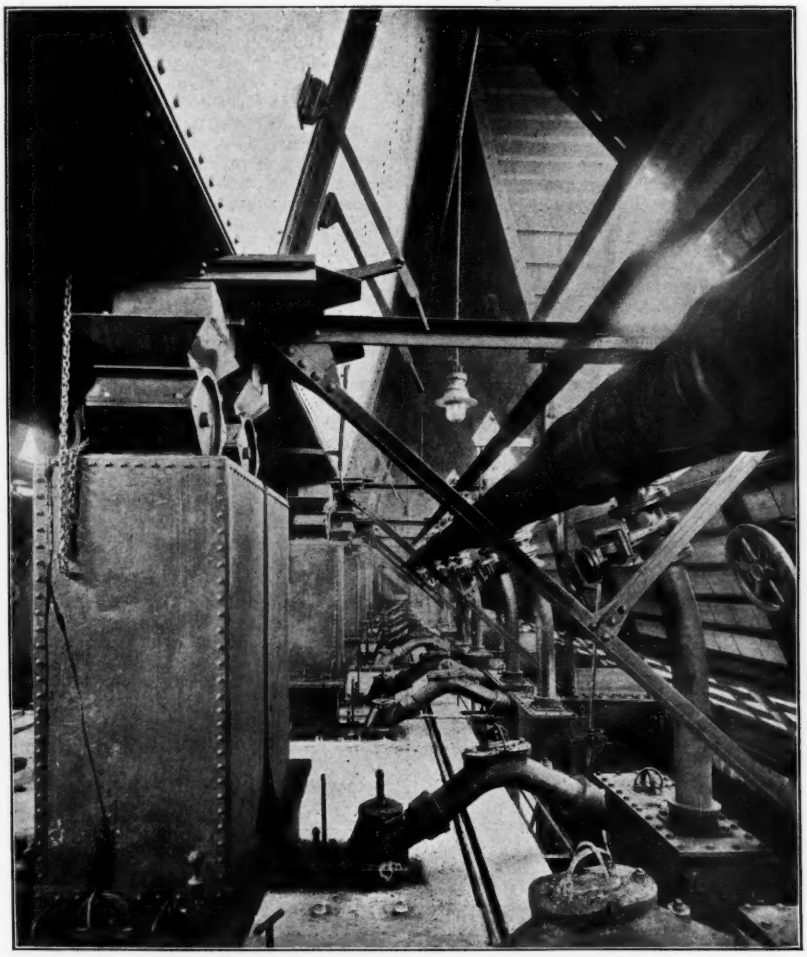
When the Poole works were first built, arrangements were made for unloading the coal *ex* ship to store in the yard by means of a travelling Temperley transporter. This transporter in turn takes the coal from the yard and discharges it into a cross gravity bucket-conveyor, which delivers the coal either to the existing horizontal retort house or to the new installation of verticals.

The storage hoppers for coal and coke in the new installation are situated in the roof, and are supported, not from the settings, but from the house structure. These hoppers have a capacity of 24 hours' supply. The gravity bucket-conveyor encircles the axis of the house, and carries coal from the gravity bucket-conveyor in the coal-yard to the coal storage hoppers above the retorts, and also takes the coke as discharged from the bottom of the retorts and carries it to the outside storage hoppers, or else into the coke-hoppers for the generators situated in the same line with the coal-hoppers.

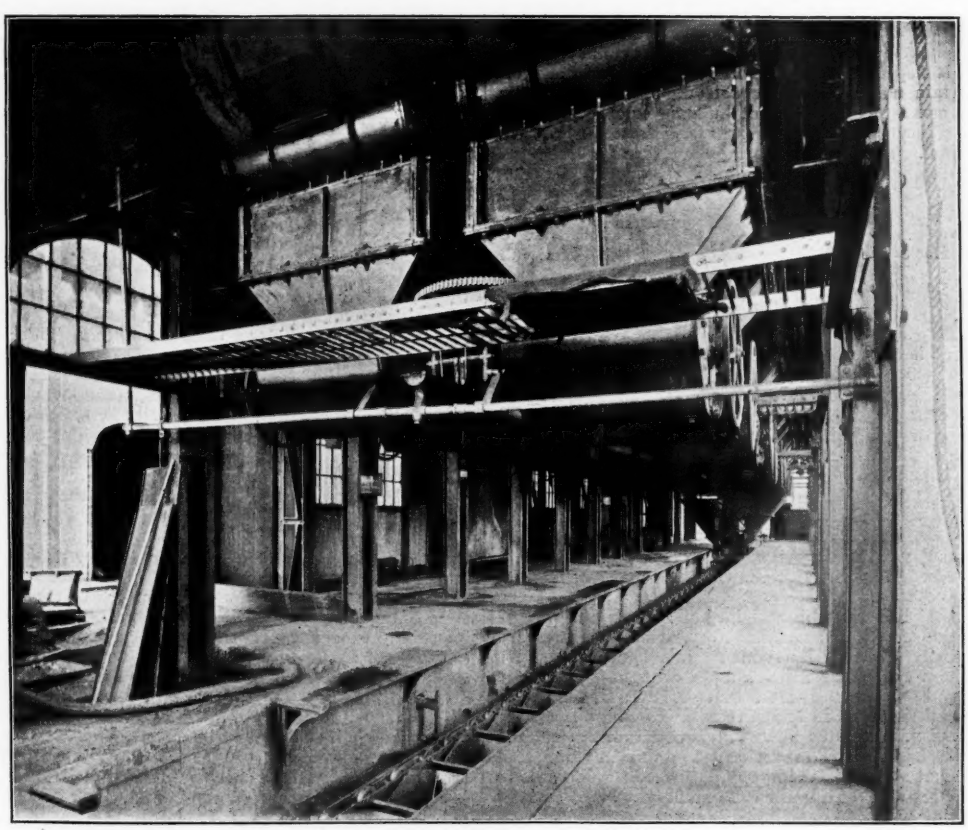
The Woodall-Duckham system of vertical retorts is now so well known that it is unnecessary to allude to it in detail. The



THE RETORT-HOUSE (LOOKING WEST) WITH THE TEMPERLEY TRANSPORTER IN THE BACKGROUND AND A PORTION OF THE COKE STORAGE COMPARTMENT HOPPER IN THE FOREGROUND.



TOP OF THE RETORT-SETTINGS, SHOWING THE COAL VALVES, SUPPLY HOPPERS, OFF-TAKE SEAL POTS, AND FOUL MAIN.



THE RETORT-HOUSE FLOOR, SHOWING THE CONVEYOR TRENCH, COKE FILLER, EXTRACTORS, AND DISCHARGERS.

chief points that strike one at Poole are the absolute cleanliness of the plant, the large amount of light to every part of the installation, and the great freedom given by this form of construction to all parts of the installation, but especially to the tops of the retorts and to the coke-discharging apparatus.

The plant is carbonizing Durham and Yorkshire coals. It is controlled by three men per shift—one on the top of the settings looking after the coal-hoppers, pipes, &c., one in charge of the conveyors, and one looking after the coke discharging. The two latter men between them carry out the clinkering. There are no tar troubles nor stopped pipes; while the coke made is bone-dry and of good silver grey appearance (which is characteristic of all coke made in these plants), and commands a ready sale.

The power required for the whole installation, making well over a million feet of gas per day, is 9 H.P. Of this, the conveyors take 8 H.P., leaving only 1 H.P. for the mechanism operating the coke discharges. This figure is extremely low, and shows the efficiency and good design of the system. No mechanical difficulties of any sort are experienced—the plant working smoothly and automatically.

This installation having proved so satisfactory, the Bournemouth Gas Company have ordered a further installation of double the capacity of the present one—that is to say, to carbonize 240 tons of coal per day.

CHIMNEY DRAUGHT AND ITS INFLUENCE ON PRODUCER WORKING.

By Frederick Shewring, of Droitwich.

When the representative of the "Journal of Gas Lighting" was looking over the Droitwich Gas-Works, on the occasion of the visit of the Midland Junior Gas Association, he put to the writer a very pertinent question, no doubt with the object of getting an explanation. Time, however, would not then permit discussion of the subject; but on his being told that a few notes had been collected which would probably form the basis of a short article, he gained his point by obtaining the promise that he should be the first to peruse them. The question referred to had more than passing significance to the above heading, and I append my comments as under.

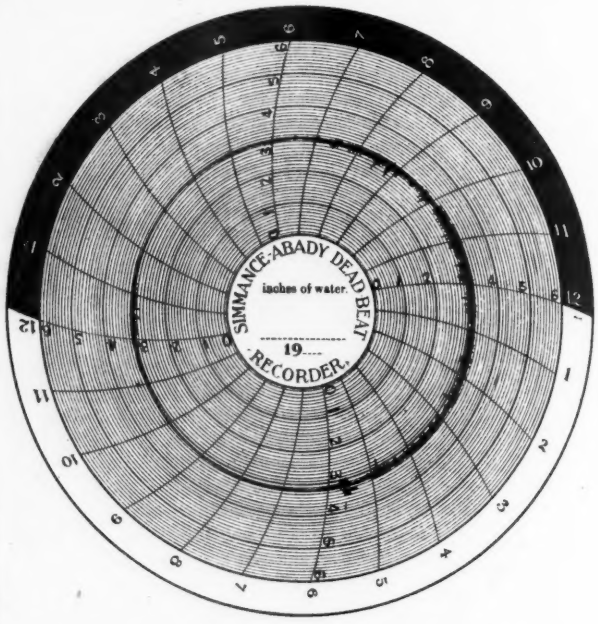
It is almost as essential to obtain a straight line on a chart off a pressure register connected to the exit gas-flue from the retort-bench, or at the chimney-stack, as it is to realize that ideal which most engineers aim at on the hydraulic or foul main of our carbonizing system. We are all aware that the former is not of such vital importance as the latter, inasmuch as the controllable gases in the foul main are the commodity which we specially lay ourselves out to manufacture; and the waste gases ascending the chimney should have done their active duty, and be void as far as possible of monetary value. The pull on a chimney, within certain limits, is dependent upon its height, design, and method of adapting certain materials in its construction which mark the difference between a well-thought-out building or otherwise. It will not be necessary for me to enter into formulæ as regards the calculation of pull. This and other valuable information relating thereto can be readily obtained from the host of published text-books and other sources. What I am desirous of touching upon is the variation of draught of chimney-stacks due to other influences. Observations taken over a fairly long period lead me to believe that climatic conditions are responsible for a varied pull on some chimneys more than on others, but that they do not produce the same effect on all settings. Also the increased temperature of waste gases entering the stack during periods of clinkering assist to raise the vacuum at a time when it is least desirable.

The pull which is considered to be most suitable for the particular work in view having been ascertained, it should be adhered to as far as possible. Any increase or loss of vacuum must influence the working of the beds. It can therefore be readily understood that a loss of vacuum for any appreciable time must mean a diminished draught on the producer; and a lowering of the heat of the setting will naturally follow. That this is undesirable, is apparent even to the uninitiated; and it points to the necessity of having a gauge connected to the chimney-stack and fixed in an accessible position, to enable the vacuum to be readily noted at any time of the day. Its inspection should, I venture to think, form part of the routine duties of the works manager or responsible foreman in charge.

A pull of 4-10ths is a workable standard adopted by many engineers, and is considered to be satisfactory. Some settings are more economically operated by reducing this figure by 25 per cent.; and I know cases where the chimney draught is even less. It is under these latter circumstances that variation of wind velocity and other outside factors assert themselves, and upset what have for a period proved to be almost ideal conditions of sailing. The margin may become too fine for general practical value; and the engineer is not always in the happy position of being able to remedy the matter without the process entailing a large amount of expenditure.

With only a moderate wind blowing, I have noticed an oscillation indicated on a pressure register chart equivalent to an additional one-tenth reduction in vacuum; and the almost every-day change of wind direction is often sufficient to bring this about. More striking evidence is sometimes to be found in the retort-house, where flames may be seen shooting around badly fitted or worn furnace feed doors and defective joints in the brickwork. Although this state of affairs cannot always be attributed to the aforesaid cause, yet it frequently may be. There are few things on a gas-works that cause more anxiety to the chief official than the inability to raise a setting quickly to a carbonizing temperature, at a time when it is urgently needed. This trouble has sometimes been experienced with settings that have been standing off for a long period, and the cause has been traced to dampness in the main flue. Whether in all instances this could have been prevented when the benches were first erected, is a matter for speculation. Perhaps it did not then exist. Yet I fail to comprehend why so many main flues of regenerative settings are inaccessible. If provision for access were made, the question of drying the flues could be easily undertaken, and this would facilitate the heating-up of the bed. Incidentally, the displacement of damp in this manner has an influence upon the chimney pull. Operating producers with as low a vacuum as is consistent with the proper gasification of the fuel, is bound to show a saving in fuel consumption, as during the processes of poking and clinkering the fires a reduced quantity of carbon monoxide is passed up the chimney stack.

The improved design of furnace of recent years, together with the larger grate area which is being allotted to newly-erected beds, is an improvement gravitating in the direction of even control and fuel economy. Some generators of the earlier type invariably require clinkering every 48 hours; and though the percentage of ash in the coke used for feeding the fires has, to a certain extent, something to do with the length of the period between the operations of clinkering, I think that it is an accepted rule for the fires to be clinkered every other day at the majority of works. I have one setting at work that has only been clinkering once a week for



nearly a year's run; and with a change of fuel there is little doubt that it would require to be done less often. This is nothing exceptional; but it indicates that with the diminished number of bar-cleaning operations, a corresponding decrease of rise and fall of temperature takes place in the main-flue and stack. Reference to the reproduced chart shows the oscillation on the chimney draught when only a moderately strong wind is blowing; and it will be noted that for some hours at a stretch the pull was almost reduced to zero point.

This leads up to the consideration of the retort-house stack itself; and from the foregoing remarks, it will be gathered how important it is to have a stack of sufficient size and capacity for the work. It is seldom that this portion of gas-works plant is really brought to the front in technical journals; and perhaps that is the reason why it is, metaphorically speaking, often lost sight of on some works. It requires the same display of engineering skill to successfully design a chimney-stack as it does to carry out the apparently more complex structures seen on many gas-works; but that in many cases they have not had this careful attention, is only too apparent.

Chimney-dampers are sometimes conspicuous by their absence; but as they can be operated to act as a check valve, and so control the vacuum on the furnaces, it is difficult to find any excuse for their omission. The extra cost involved in fitting is hardly worth consideration, and should not count. For my part, I should always design a stack to give a margin of draught over and above that which is required, and use a damper to regulate to the necessary degree. It is also advisable to keep the boiler-plant and the retort-house stacks separate; one reason for this being to enable

independent samples of gases to be taken for analysis. That the analyzing of spent gases is a helpful guide to efficiency in working, is justification for the carrying out of tests; and it also points to the importance of paying due regard to the brickwork joints of the flues, &c., to prevent any influx of cold air.

Passing from the question of chimney draught to the conditions found in the producer itself, it will be seen that the correct ratio of secondary to primary air is in no way controlled. The formation of clinker, depth of fuel-bed, and other factors, all tend to counteract this. A practical solution may be found in automatically controlling the air supply at the setting; for it seems difficult to continuously obtain the desired proportionate admixture with our present mode of working. There are devices on the market which can be used to govern the primary and secondary air to regenerative settings, and they effect economy in fuel consumption. But they are not by any means in general use, and perhaps may still be subject to improvements.

In the meantime, something may be gained by giving the chimney draught question a little more individual attention under our own particular circumstances, the outcome of which may probably be to lead up to some detail that, with increased knowledge, can be turned to profitable account.

FRENCH RETORT-DRAWING MACHINE.

The Paris Gas Company have lately taken out a patent for a retort-drawing machine. It consists of a coke-pusher fixed on the end of an iron beam formed in sections, like a telescope; forward movement being facilitated by rollers mounted on different parts of the beam. The following particulars of the machine, the construction of which is shown in the accompanying illustrations, have been translated from the French specification.

Fig. 1 is a longitudinal section of the machine when at rest;

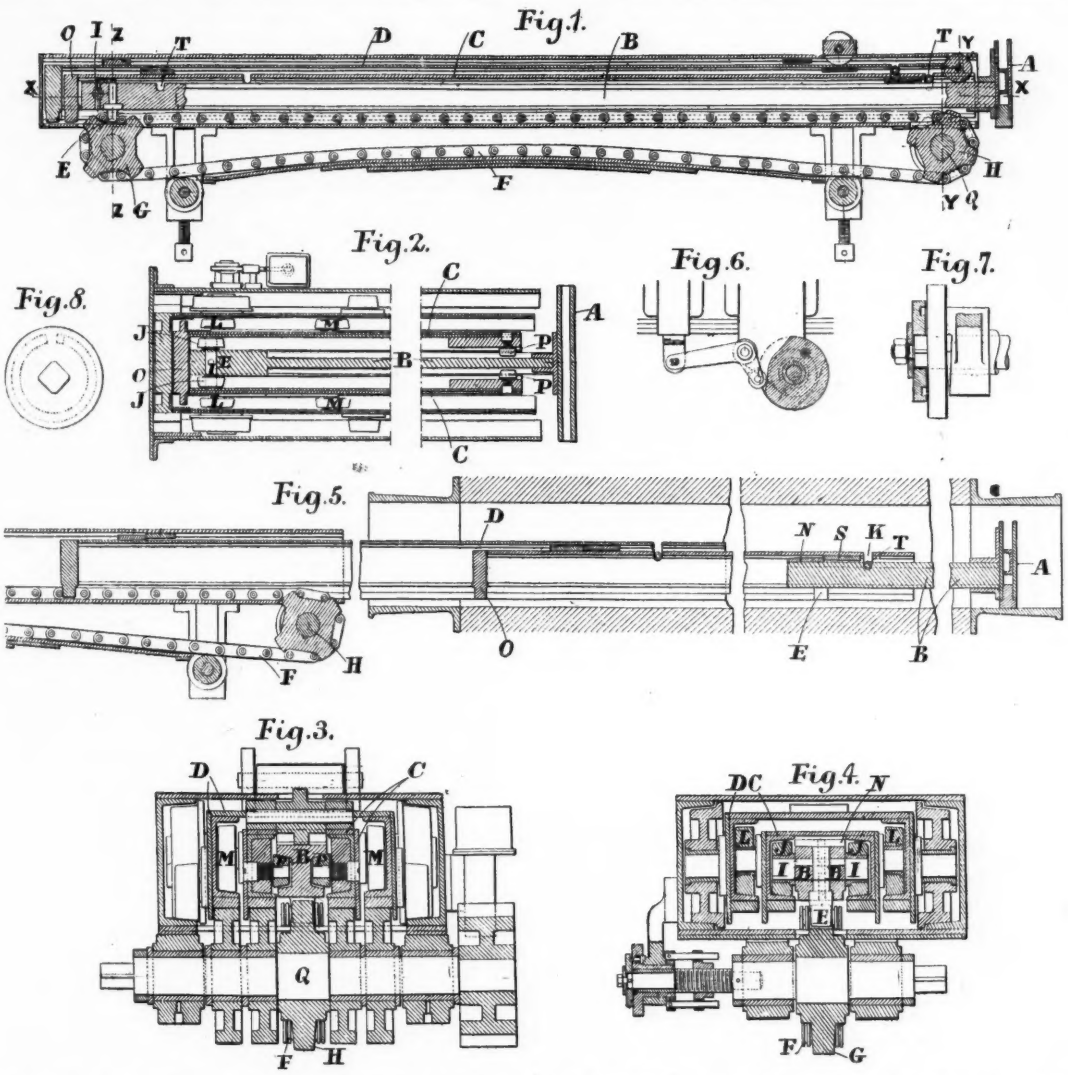


fig. 2, a part section on the line X of fig. 1; figs. 3 and 4 are enlarged transverse sections on the lines Y and Z of fig. 1; fig. 5 is a section showing the full extent of the machine; and figs. 6, 7, and 8 show details of the automatic stop mechanism.

The coke pusher A is fixed on the end of a telescopic beam formed in three portions, B C D, which are moved one after the other. The inner part B is hollowed on two sides, and has on the lower side a tooth E, which engages with an endless chain F running over the two pulleys G H. Near the tooth is fixed a shaft I (fig. 4), on which rollers J are mounted. Moreover, there is a boss N on B, and a notch K in which a pin, forming part of the beam, engages. This portion of the beam has also a tooth O to engage with the chain F, in the vicinity of which are rollers L M. There are others P, mounted on plates, engaging on the sides of the central portion of the beam. The discharger is provided with mechanism which causes it to stop at the end of the backward stroke (see figs. 6, 7, and 8).

The machine operates as follows: A pinion works the shaft Q and the pulley H, which actuates the chain F running over the loose pulley G. The tooth E of the central part of the beam, being engaged with the chain, moves forward the rammer A, which enters the retort and pushes out the coke. Forward movement of the inner portion B is facilitated by the rollers J running in the angle-irons. When the tooth E moves to a position near the pulley H, the boss N impinges upon S and begins to entrain the part C, while the pin T drops into the notch K and connects the parts B and C. Thus when E is released from the chain F, the tooth O is entrained. When this arrives near the pulley H, a boss impinges upon another and begins to entrain the part D of the beam; while a pin drops into a notch and connects the parts C and D. Thus when the tooth O releases the chain, another is engaged with the chain F which carries it along. In this movement the rollers M P run on irons of the jacket of the beam; at the same time others guide the portion D of the beam. Forward movement continues until it is checked by the pusher reaching the extremity of the retort. At this moment an automatic stop device acts so as to arrest the forward motion of the chain F. To bring the beam back, the shaft Q must be turned in the opposite direction. The tooth O is made to engage with the chain, and bring part C to the back; the latter, in turn, entrains, by means of the boss S, boss N of the central part B, to make the tooth E engage with the chain. When the beam reaches the position shown in fig. 1, the rear automatic piece of the machine comes directly into action.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Cambridge.

The Forty-Ninth General Meeting of the Association was held at Cambridge last Thursday. The members and friends who assembled sufficiently early made the University Arms Hotel their *rendezvous*, and had lunch there, with the President (Mr. T. A. Guyatt, of Ely) in the chair. It was a large gathering—Cambridge always proving a convenient centre for these gatherings. The lunch being an informal one, there were no toasts excepting the loyal one, and a little compliment paid to the President.

The Business Meeting.

Thanks to the Hon. Secretary (Mr. Joseph Davis, of Gravesend), who is unbending on the point of the programme receiving due compliance in regard to time, the meeting commenced sharp at three o'clock. By the kindness of the Vice-Chancellor and the authorities, the place of assembly was the University Chemical Laboratory. The members having assembled,

The PRESIDENT said that, before commencing the technical proceedings, he should like to introduce the Mayor of Cambridge (Mr. W. H. Francis), who had honoured the members with his presence, and who would say a few words of welcome to them.

His WORSHIP said he had great pleasure in welcoming the members to the historic town of Cambridge, which they would find was a most delightful place. His only regret was that their visitors were to be there for so short a time. His remarks would be brief, because the less time they spent under cover on such a beautiful day the better. He saw that they had a long programme of business to get through; and he hoped their discussions would be very successful. He spoke of the wonderful place that Cambridge was, of its classic buildings, of its clever men, and of its associations. The borough was a matter of 800 or 900 years old; and it had a Charter dating back to Henry I. With regard to the Gas Company, his brother-in-law was at the head of it; and it could be instanced as one of the most successful of the undertakings in Cambridge. The Engineer (Mr. Auchterlonie), whom they all honoured and esteemed, knew his work thoroughly, and served the Company well.

MINUTES CONFIRMED.

The HON. SECRETARY read the minutes of the forty-eighth general meeting, held at Ely on Sept. 27 last; and they were duly confirmed.

LETTERS OF REGRET.

Reference was next made by the HON. SECRETARY to a number of letters of regret at absence. Among them was one from the Vice-Chancellor of the University, the Chairman of the Gas Company, Professor Hopkinson, and others, including the Vice-President of the Association, Mr. T. Goulden, Chief Engineer of the Gaslight and Coke Company. Mr. Goulden was down for a paper; and he had had to send Mr. T. S. Lacey, of the Nine Elms works, as his representative, to read it. Mr. Goulden explained that, owing to the absence of the Governor (Sir Corbet Woodall) lately on the Continent, unfortunately for the appointment to read a paper, the date of an inspection by the Supervision Committee had been deferred to the 24th. This would prevent his presence at Cambridge that day. He had, however, arranged with Mr. Lacey, who had been at Beckton, to attend the meeting, and to read the paper. It was, the writer added, with great regret that he had to do this, and he asked the Hon. Secretary to convey his apologies to the President and members generally.

The PRESIDENT observed that they were all sorry that an unavoidable engagement had intervened to prevent the presence of their Vice-President; but in the reading of the paper, Mr. Lacey would, he was sure, fill his place with great satisfaction.

THE KNIGHTHOOD OF THE PRESIDENT OF THE INSTITUTION.

The HON. SECRETARY remarked that, since the last meeting, a very high distinction had been conferred by His Majesty the King upon the President of the Institution of Gas Engineers. A letter of congratulation was sent from the Association; and Sir Corbet Woodall replied, asking him (Mr. Davis) to accept and to convey to the President, Vice-President, and members generally his cordial thanks for their kind congratulation and good wishes for the future, which he cordially reciprocated.

ANNUAL REPORT AND ACCOUNTS.

On the proposition of Mr. H. WIMHURST (Sleaford), the Committee's annual report and the accounts were adopted. The former briefly traced the proceedings of the year; and in the concluding paragraphs stated: "The year commenced with a membership of 115. The Committee much regret the loss of two of their members by death during the year—Mr. C. F. Ruggles, of Leighton Buzzard, a Past-President of the Association, and Mr. Henry John Davis, of London. Two resignations have been received with regret; three members drop out automatically, under Rule 19; while sixteen new members have been elected during the year—the total membership at the end of the year being 126. The accounts show a balance in the hands of the Hon. Treasurer of £7 7s. 11d.—the amount received in subscriptions during the year having been £61 19s., and the expenditure for the same period £56 17s. 8d. The balance brought forward was £2 6s. 7d. The Commercial Sections have met frequently during the year, and continue to do much good and useful work.'

NEW MEMBERS AND ASSOCIATES.

Moved by Mr. F. M. PATERNOSTER (Felixstowe), seconded by Mr. W. B. FARQUHAR (Ilford), the following gentlemen were elected members: Mr. L. G. Barber, of Cambridge, Mr. J. Ratcliffe, of Alford, Mr. R. Walker, of Uppingham, Mr. R. Dennington, of Cambridge, Mr. F. A. West, of Pinner, and Mr. J. H. Salmon, of Skegness.

Proposed by Mr. F. L. WIMHURST (Newcastle-under-Lyme), seconded by Mr. G. R. CASTERTON (Melton Mowbray), Mr. G. Hands, of Croydon, and Mr. C. B. Donkin, of Birmingham, were elected Associates.

LIGHTING AND HEATING OF LABOUR EXCHANGES.

Mr. JOHN CARTER (Lincoln) said there was a matter to which he wished to draw the attention of the members. He would like the ruling of the President as to whether it should be dealt with at this stage, or later in the proceedings. It had reference to the alleged order that had been issued by the Office of Works in relation to the lighting arrangements for the various Labour Exchanges established up and down the country. He thought it would be no news to his friends that a statement had been made, on the authority of a Government Department, that a general order had been issued that gas lighting should not be allowed in any of these public institutions. Whether the attention of the Council of the Institution of Gas Engineers had already been drawn to this subject, he could not say, or whether, if their attention had been drawn to it, any action had been taken, he was quite in the dark. He was, however, convinced that this was one of those matters the gas industry should not take quietly, or submit to lying down. He wanted to propose a resolution calling the attention of the Council of the Institution to the matter; and if this was the proper time in the proceedings to do so, he would move it.

The PRESIDENT thought the time was a favourable one for moving the resolution.

Mr. CARTER said he would therefore move that the Eastern Counties Gas Managers' Association desire to call the attention of the Council of the Institution of Gas Engineers to the matter to which he had referred, with the view to their taking vigorous and very prompt action in regard to it. It would be, he had no doubt, quite within the knowledge of those present that a few months ago a letter appeared in the "JOURNAL OF GAS LIGHTING" by one of their colleagues in the North of England, complaining of the existence of a general order of the character to which he (Mr. Carter) had alluded. He daresay it would be said that no such general instruction had been issued. But he must ask his friends to take his word for this, that there was no reasonable room to doubt that from a Government source a general instruction had gone forth in the country that, wherever Labour Exchanges were established in the various towns—north, south, east, or west—if any other methods were available, gas lighting was not to be adopted. Unfortunately, this general instruction was not accompanied by any intimation that the gas industry was to be relieved of its usual contribution to the Imperial Treasury. So long as an important industry was taxed for general purposes, he thought it had good reason to complain of any order issued from a central authority that interfered with the conduct of its business or its development. There might be considerable difficulty in establishing their position. They might be told that no such order, or no such instruction, had been issued. The members might take it from him that, whatever they were told, such an instruction had been issued, and authority given in regard to it in the various districts of the country. His experience in Lincoln had been exactly on all-fours with the experience of their friend in the North who wrote to the "JOURNAL" a few months ago; and probably the editorial notes that then appeared on the subject would be fresh in the memory of the members. But so far as he could gather, no definite action had been taken by those whose first duty was to protect the interests of the gas industry; and it was high time that some pressure was brought to bear on the central representative body, when the industry was attacked in the way that it had been in this instance, to take effective steps to protect it from unfairness of this character. He had had with the official in his own district a somewhat active correspondence; and perhaps some of his views were rather strongly expressed. The gas industry had sufficient influence, and it ought to have sufficient authority behind it, to get at the bottom of a thing like this. They ought to be able to employ all their influence in such a way as to stop this unfair tax upon an industry which provided remunerative employment for 120 millions of capital, supplied a livelihood for a large section of the country's workers, and rendered very important daily service in the commercial and domestic life of the country. He therefore proposed that the Hon. Secretary should call the attention of the Council of the Institution of Gas Engineers to this matter, with the view to prompt and vigorous measures being taken to obtain the suppression of such an order, if it had been issued, and, if not, then to make it clear throughout the country that there was no such order in existence.

Mr. J. T. JOLLIFFE (Ipswich) seconded the motion. He said he

was afraid that it was unfortunately too true that such an order had been issued. At Ipswich the Gas Company tendered, and successfully tendered, for not only lighting but heating the Labour Bureau; and, after having obtained the order, they were told that instructions had come from the central authority stating that gas was not to be used for lighting or heating. Therefore the order that had been given to the Gas Company was stopped.

The PRESIDENT said it seemed to him to be a serious matter that they had before them; and it ought without delay to be brought to the attention of the Council of the Institution. From the remarks Mr. Carter had made, and which were confirmed by Mr. Jolliffe's experience, there seemed to be no doubt as to the present situation. He personally agreed with the resolution.

The motion was carried unanimously.

The HON. SECRETARY also agreed with what had been said by Mr. Carter and by Mr. Jolliffe. He would see that the feeling of the meeting was properly represented before the Council of the Institution.

PAPERS READ AND DISCUSSED.

A paper prepared by Mr. THOMAS GOULDEN (and read in his absence by Mr. T. S. LACEY), described the reconstruction of the plant in the large No. 12 retort-house at the Beckton works of the Gaslight and Coke Company. Following the discussion of this paper, Mr. W. ORME, of Woodbridge, made a communication on the subject of burners. Both papers and the discussions will be found on other pages of this issue.

ELECTION OF OFFICERS.

The PRESIDENT proposed that Mr. T. Goulden, the Vice-President, be elected to fill the office of President as from September next. Mr. Goulden was known to all the members by reputation, though perhaps not so well personally. Being Chief Engineer of the Gaslight and Coke Company, he was a very busy man, and so unfortunately he had not been able to be a regular attendant at the meetings of the Association.

Mr. R. G. SHADBOLT (Grantham) said he did not suppose there was a district in the country or in the United Kingdom that contained men who dealt with the largest and possibly the smallest of gas matters to the extent that the Eastern Counties did. They had men there who were placed in charge of small works in small districts, who had their troubles and difficulties. Yet they had also the engineer of the largest gas undertaking in the world; and his operations were not on such a scale that he could not prepare a paper that was of the greatest service to them all.

The motion was cordially agreed to.

Mr. H. WIMHURST proposed that Mr. Farquhar, of Ilford, be the Vice-President for the coming year.

Mr. J. H. TROUGHTON (Newmarket) seconded the proposition, and it was heartily carried.

Mr. FARQUHAR thanked the members for having elected him, and said he should do his utmost to support the President during the year.

The PRESIDENT moved the re-election of the Hon. Secretary and Treasurer (Mr. Joseph Davis). Knowing Mr. Davis so well as the members did, and the character of the work that he did for the Association, it was, he remarked, useless to make any observations concerning him.

Mr. WIMHURST seconded the motion, which was cordially passed.

The HON. SECRETARY acknowledged the compliment conveyed by his re-election, and moved the re-election of the Auditors, Mr. W. Beale, of Royston, and Mr. W. Brown, of Brandon.

Mr. FARQUHAR seconded the motion; and it was unanimously carried.

Messrs. Terrace and Clark were appointed members of the Committee, in place of the retiring members, Messrs. Fenwick and Mitchell.

THE NEXT MEETING AND THE NATIONAL GAS EXHIBITION.

The PRESIDENT remarked that the next question was the place of the autumn meeting. It was suggested that they should meet in London, on a date to be left for further consideration.

The HON. SECRETARY mentioned that it was the wish of the President-Elect that they should meet in London. He (Mr. Davis) had also received a letter from the Secretary of the National Gas Exhibition, in which it was stated that the Organizing Committee were now drawing up a programme of daily events in connection with the exhibition; and they suggested that on Monday, Oct. 13, the Association should pay an official visit to the exhibition. Mr. Dunn asked to be informed as early as possible whether this date would be convenient. Steps would then be taken to make it known throughout the district that the day would be an Eastern Counties Day for the exhibition, and efforts might be made to run special trains from the Eastern Counties on that day. It was, of course, understood that the programme of the day's visit would be left entirely a matter for the decision of the Association. The Committee would endeavour to arrange for a conference room to be at the disposal of the Association, during the whole or part of the day.

Some discussion followed the reading of the letter. The view was expressed that the meeting should be held in London, and that there should be a visit to the exhibition. But there was a division of opinion as to whether the meeting should be held on the same day as the one set apart for the exhibition. Monday was also regarded as an unsuitable day; and one suggestion was that, if the meeting were held on a Thursday or Friday, the succeeding day could be allocated to the exhibition visit.

In the result, it was left to the Committee to make the best possible arrangements.

VOTES OF THANKS.

Mr. J. W. AUCHTERLONIE (Cambridge) proposed, and Mr. THOMAS GLOVER seconded, a vote of thanks to the President, Vice-President, Committee, Hon. Secretary, and the Auditors for their services.

This was heartily agreed to.

On the motion of the PRESIDENT, seconded by Mr. G. R. CASTERTON (Melton Mowbray), the Vice-Chancellor and the authorities were cordially thanked for placing the new Lecture Room of the University Chemical Laboratory at the disposal of the Association for the meeting.

Moved by Mr. GLOVER, and seconded by Mr. R. WARDELL (Enfield), a hearty vote of thanks was passed to the readers of the papers.

DINNER AND TOASTS.

In the evening, the members dined together at the Lion Hotel—the President in the chair. Among the guests were His Worship the Mayor and Professor Pope. After dinner, several toasts were honoured. Mr. Arthur Hall, one of the Directors of the Ely Gas Company, proposed "Success to the Eastern Counties Gas Managers' Association;" and the President responded. The toast of "The University and Town of Cambridge" was confidently entrusted to Mr. J. Carter. In the course of his remarks, he referred to the efficient service the Cambridge Gas Company were rendering to the town; and there were references in his speech to the general subject of the municipal control of gas undertakings. The Mayor, in the course of his reply, acknowledged the excellent services of the Gas Company. Allusion, he said, had been made to the question of street lighting; and he could assure those present that he was only too thankful that a scheme which was proposed some years ago for electric lighting did not take root there. He thought they could not be too thankful that they had gas for their illuminant in the streets, especially when they took account of the cheap rate at which the Company supplied it to them, and the excellent quality which they gave. His Worship differed somewhat from Mr. Carter on the subject of municipal control of trading enterprise. He could not understand how anybody who had had experience of municipal trading could wish for such useful undertakings as gas, water, or electricity getting into the hands of a municipal body. Professor Pope, responding on behalf of the University, referred to the fact that the gas industry was in a better position to-day than ever. In his opinion, the future progress of gas manufacture would rest more in the hands of the chemist than in those of the engineer. Mr. R. G. Shadbolt proposed "Kindred Associations," and Mr. T. Glover responded. "The President" was proposed by Mr. J. T. Jolliffe; the "Hon. Secretary" by Mr. J. Young; and "The Press" by Mr. J. H. Troughton. The speeches were interspersed with quartettes, duets, and songs by "The Magpies;" and their entertainment met with hearty approbation.

Illumination of Steel-Works.—The following figures show, in terms of foot-candles, the intensities of illumination found necessary in some American steel-works: General lighting of buildings, 0·4 to 0·6; warehouses, 0·3 to 0·5; inspection-tables, 3·5; shops, 0·5 to 1; machine tools, 5; offices, 4; drawing offices, 4 to 6.

Fresh-Water Animals in Mains.—At a recent meeting of the Zoological Society, Dr. S. F. Harmer, Keeper of Zoology at the Natural History Museum, read a paper on the polyzoa of water-works. He referred to the extraordinary numbers of fresh-water animals which in some cases had been found in the mains and supply-pipes in various towns, representing both sessile or fixed animals and free-swimming forms, including sometimes eels and sticklebacks. The polyzoa were usually the most abundant and most injurious; they were fixed compound animals, which died down in winter and left buds which were carried in the current of water to all parts of the system, and often grew to such an extent as to choke the pipes. The author said these biological difficulties only occurred where no system of filtration was installed; and they had led to epidemics.

Naphthalene as a Briquette Binder.—Reference has already been made in the "JOURNAL" to the use of naphthalene for making briquettes. It appears, from a paragraph in the "Iron and Coal Trades Review," that the first process used in Germany for coal briquetting with naphthalene as a binder was that of Buss-Fohr, in which naphthalene was introduced, together with superheated steam having a temperature somewhat higher than the boiling-point of the naphthalene; the idea being that this would evaporate, and thoroughly permeate the coal mass. The temperature of the steam proved, however, to be low, and no greater heat could be used owing to the difficulty of handling in the presses masses that are too hot. It is stated that the Shüring process avoids this difficulty, first by evaporating the naphthalene in a special gasifier, and then introducing it by steam pressure into the deeper zones of the coal dust. Tar is still used as a binder; but instead of the 6½ per cent. required when no naphthalene is added, good briquettes can, it is said, be produced with 4½ to 5 per cent. of tar and only 0·3 per cent. of naphthalene.

NOTES ON THE RECENT RECONSTRUCTION OF A RETORT-HOUSE AT BECKTON.

By Thomas Goulden, of London.

[A Paper read before the Eastern Counties Gas Managers' Association, April 24.]

In the absence of the author, Mr. T. S. Lacey (Engineer-in-Charge of the Nine Elms works of the Gaslight and Coke Company) read the paper. Before commencing it, he remarked that the members had already been informed as to the reason of the author's absence. He was sure that Mr. Goulden very much regretted that he could not be at the meeting; and he (Mr. Lacey) hoped they would accept him as a willing, if not a satisfactory, substitute. He thought it quite possible that the reason Mr. Goulden had asked him to take his place at the meeting was because he knew that he had been personally acquainted with the old house of which the paper described the reconstruction, and that he was at Beckton during the time of the original construction. He must say that he had taken great interest in the work; and personally he should have had great pleasure if he had been present as a listener, and to take part in congratulating Mr. Goulden upon the wonderful improvement in effectiveness and value of the house since the reconstruction. Mr. Lacey then read the paper, which was as follows:

In looking round for the subject-matter of a paper on which to address you to-day, it was borne in on the mind of the writer that, during a recent discussion of the general subject of gas-works engineering, it was suggested (and the suggestion appeared to be favourably received) that the publication of some of the works of reconstruction which have been effected in the manufacturing stations of the Gaslight and Coke Company would be of interest to the profession. Whether the opinion so expressed be correct or no, such works of reconstruction have certainly been the subject of very profound interest to the writer, who proposes in this paper to present one instance of reconstruction—that of one of the last retort-houses dealt with at Beckton—in the hope that it will prove of some interest to those now present.

General Design.

The general design of Beckton was, as most of you doubtless know, that of a double line of retort-houses built end-to-end, laid out in the form of a horseshoe, the heels of which were to rest on the northern bank of the River Thames, forming the abutments of two deep-water piers at which the discharge of coal ships would take place. Between the two lines of retort-houses, and in the interior of each line of houses, next the side walls, are built high-level viaducts, on which coal trains are run, the space underneath forming inside and outside coal-stores. All the houses are of the stage type; the coke-hold floor being coincident with the general ground level of the yard.

Retort-house No. 12, the reconstruction of which is the subject of this paper, is the last built at Beckton in accordance with the original lay-out of the works designed by the late F. J. Evans, but was not fitted with retorts until 1884. It was the first of the Beckton retort-houses to be fitted with regenerative appliances; and it was the first in which machinery was applied on its first being lit up.

Before proceeding to the details of its reconstruction, it will be interesting to have some knowledge of the interior arrangement of the retort-house as it then stood.

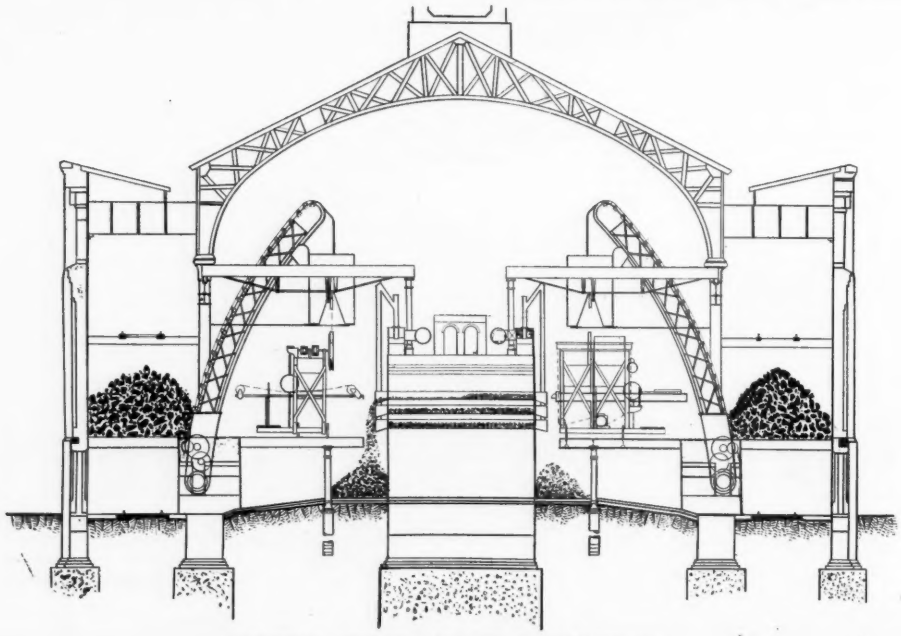
It will be seen from the diagram that extending through the length of the house—the interior dimensions of which are 510 feet by 100 feet wide—were built three blocks of retort-settings, in the intervals between which were the basements of the two chimney shafts by which the draught in the retort-settings was obtained. The middle block contained twenty-three, and each end block eleven settings. The arrangement of retorts was the same throughout the house—nine "throughs" in each setting, 20 feet long, the cross section of each retort being of a Ω shape, with 20 inches as its extreme width and 13 inches as its height.

The charging and drawing machines, of which six pairs were originally installed, were operated, as was then usual, from opposite sides of the retort-bench, travelling on tram rails laid on the charging stage parallel to the face of the bench. Eight sets of coal breaking and elevating plant were fitted, each feeding its own storage hopper, from which the charging machines were supplied as their subsidiary hoppers were exhausted. Both charging and drawing machines were driven by endless cotton ropes, taking a turn round the driving pulley of each machine on its particular side of the house. Two engines installed at one end of the house communicated motion to the driving ropes. Each of the eight sets of coal breaking and elevating plant had its separate driving engine, and in all cases the actuating power was steam. Although six pairs of stoking machines were installed, four pairs only were used for the six-hour charges then in vogue, the remaining two pairs being kept as a reserve in case of the breakdown of any of those in operation, or should the necessities of manufacture demand four-hour charges of coal being carbonized.

The charging machines, it need hardly be stated, were mechanically operated scoops, while the drawing machines were mechanically actuated rakes. The coke drawn from the retorts was either fed into the furnaces direct by means of suitable shoots, or allowed to fall past the front of the stage into the coke hold, where it was quenched and forked into waggons travelling in trains passing through the length of the ground floor of the house. The carbonizing capacity of the house as thus fitted was equal to 486 tons of coal per day, equivalent to a daily productive power of 5 million cubic feet of gas. Each through setting was fired from either side; so that throughout the house there were 90 fires.

The House as Reconstructed.

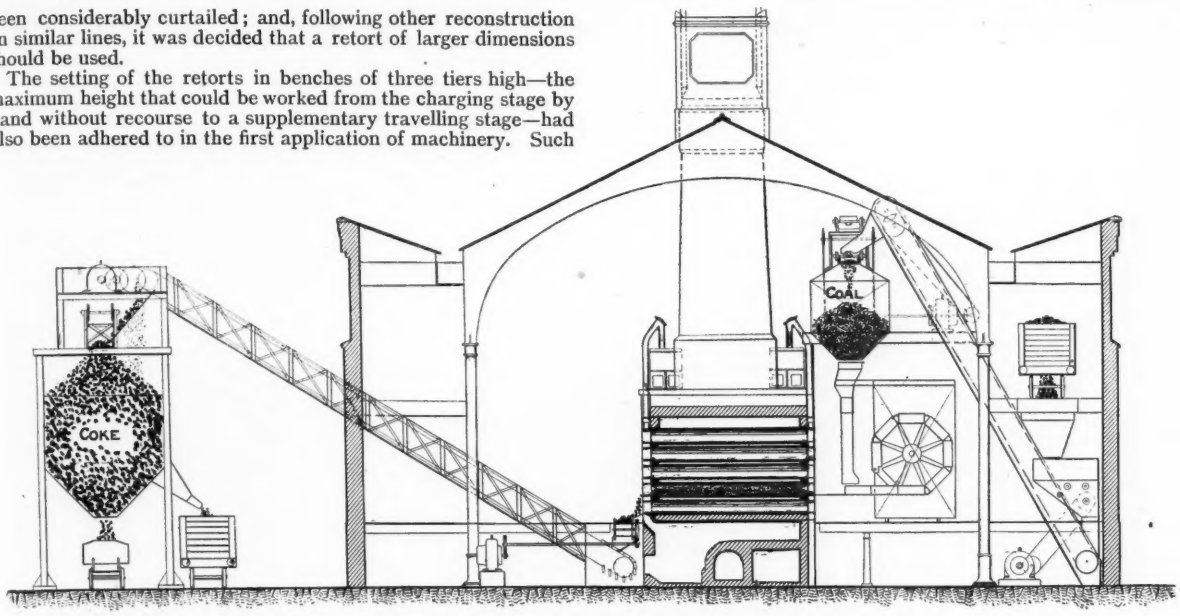
The retort-house, thus briefly described, was at the time of its being brought into action quite in the first line of the best developments of retort-house practice, and for a number of years did excellent work. But the march of progress gradually caused it to relatively lose its original position, until, eventually, the retort beds requiring to be rebuilt, reconstruction was decided upon. At the time of this retort-house being first fitted, the transition from handwork to machinery was only just being effected, and the size of the retort, in the application of machinery, was not varied from that used in the handwork houses where the normal charge per 10 feet retort did not exceed 3 cwt. of coal. In continuing the use of this retort, the economical use of the stoking machines had



ORIGINAL SECTION OF THE RETORT-HOUSE.

been considerably curtailed; and, following other reconstruction on similar lines, it was decided that a retort of larger dimensions should be used.

The setting of the retorts in benches of three tiers high—the maximum height that could be worked from the charging stage by hand without recourse to a supplementary travelling stage—had also been adhered to in the first application of machinery. Such



SECTION THROUGH THE RETORT-HOUSE AFTER RECONSTRUCTION.

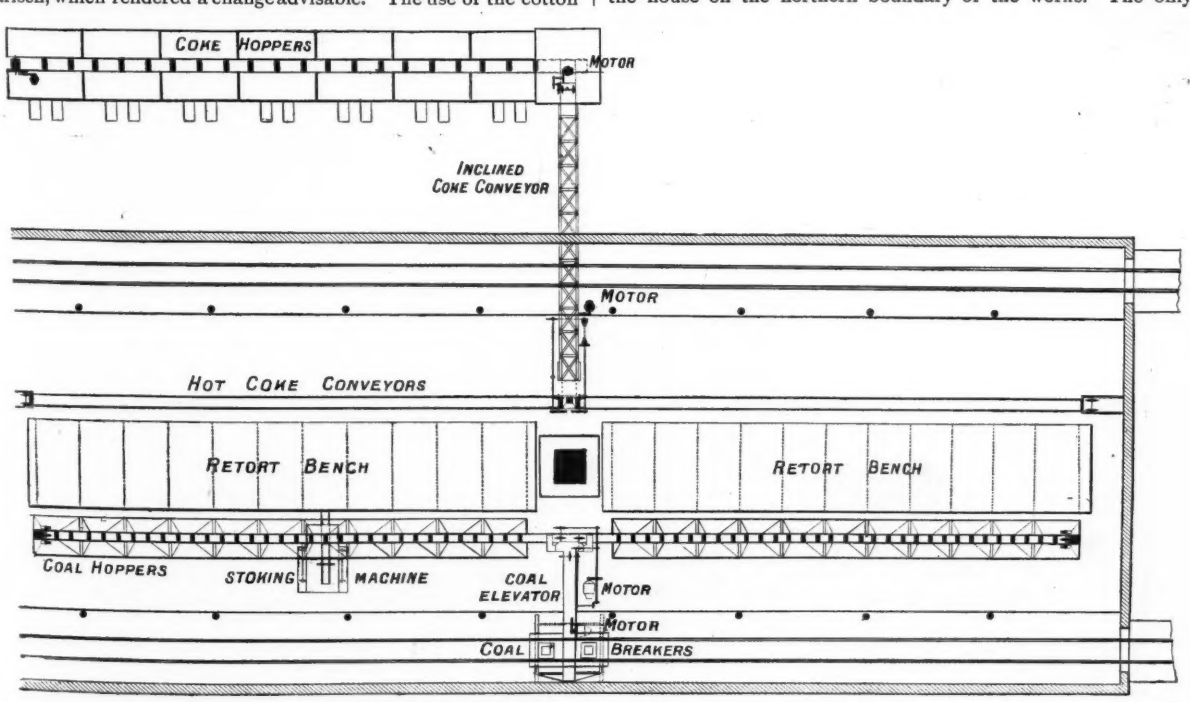
arrangement, especially in arches of the limited width of 8 ft. 6 in., as in this case, left too little free space in the interior of the setting, and, besides prohibiting the possibility of an effective combustion chamber, necessitated such a rapid rate in the travel of the producer gases passing through the setting, as to cause a greater expenditure of fuel than would have been necessary had greater free space given them more time in which to communicate their temperature to the retorts it was their function to heat. For this reason, settings of tens, set in two vertical lines of five retorts each, were adopted, thus allowing of ample space for a combustion chamber between, built in the form of a rough elliptical arch—a slight variant of the Gothic arch, which I believe was first adopted by the South Metropolitan Gas Company. This is in every way an excellent arrangement. The jets of producer gas, issuing from the crown of the generator, not impinging on the retorts, as in the older setting, but burning vertically between the two superimposed lines of retorts, making more use of radiant than of convected heat, and considerably prolonging the life of the setting, as well as being more economical in fuel. The arrangement also permitted the fitting of larger retorts in the same width of arch—thus increasing in an important degree the carbonizing capacity of the house. The feeding of the furnaces is, of course, arranged for from one side of the house only (that opposite to which the machines travel) to facilitate charging with hot coke.

Machinery.

With regard to the machinery, a series of new factors had also arisen, which rendered a change advisable. The use of the cotton ropes, travelling along the whole length of a house of such extreme length had been found most undesirable. The machines themselves (as has been remarked) apart from excessive noise worked excellently; but the desirability of replacing the manual handling of coke by mechanical means rendered it an economical necessity to instal machines of a different type, which could be operated from one side of the retort stack only. The adoption of such a new type of stoking machine also rendered necessary the revision of the coal-handling arrangements, which, as has been stated, included a separate set of plant at no less than eight points in the house. The multiplication of these isolated coaling plants, in addition to the two engines actuating the driving ropes of the stoking machinery, tended naturally to high labour charges, while the cost of upkeep was considerable—being rarely less than 3½d. per ton of coal carbonized. After careful consideration, the Fiddes-Aldridge machine was chosen as the new charging and discharging agency; two machines now effectively replacing the four pairs of machines formerly in actual use.

Arrangement of Retort-Benches.

The question of arranging the retort-benches was practically decided by consideration of the best mechanical means of taking the coke produced from the front of the settings and placing it in elevated storage hoppers, from which it could be discharged, by its own gravity, into the waggons used for its carriage from the works. Storage bins at either end of the house were impracticable; the only available place being a site parallel to one side of the house on the northern boundary of the works. The only

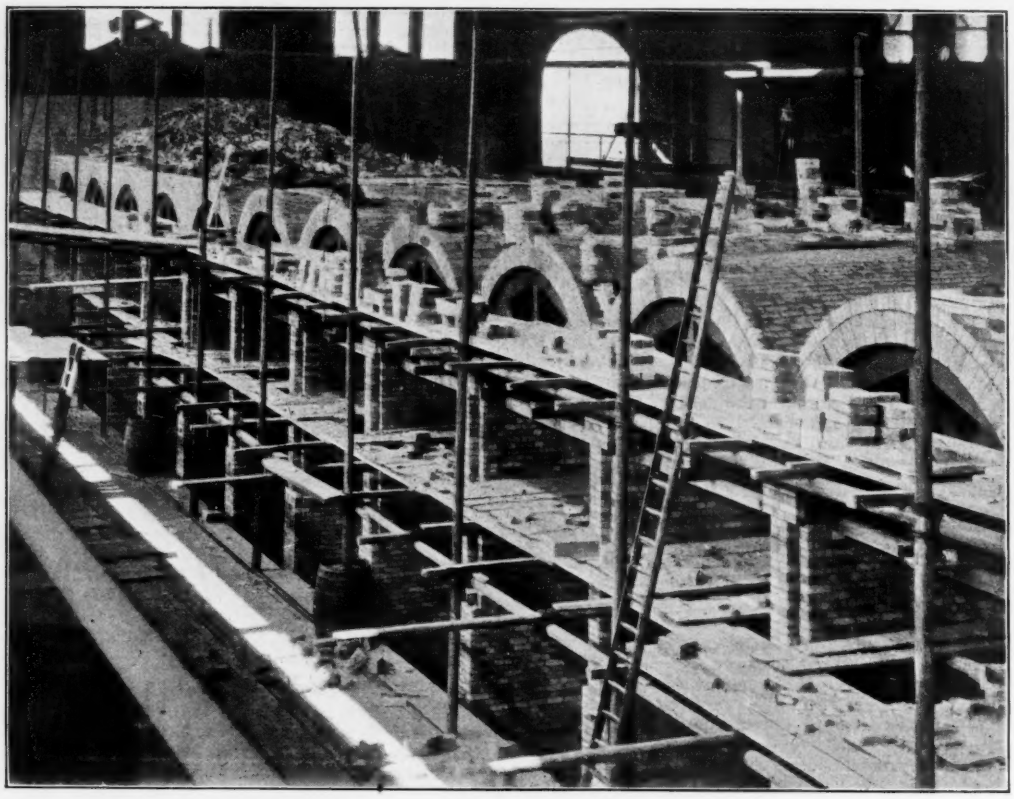


PLAN OF HALF THE RETORT-HOUSE, AFTER RECONSTRUCTION.

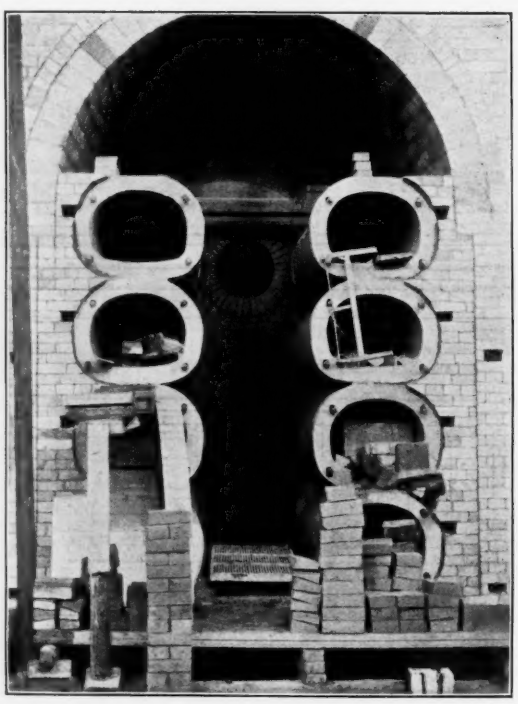
satisfactory type of hot-coke conveyor known to the author is that described as the De Brouwer. But it was at once recognized that a single chain of such length as to work throughout the length of this house without undue wear and tear was out of the question. Besides which, in a house of such size as this, it is more often than not necessary to deal with the retort-settings otherwise than as a single unit in the letting-down, lighting-up, and renewal of settings. The inconveniences attaching to the conveying of red hot coke past the front of settings in course of renewal is, of course, obvious.

Eventually it was decided to divide the central bench of twenty-three settings into two sections, each of eleven, doing away with No. 12 (the one central setting). This divided the whole of the house into four sections each of eleven settings. It will be seen at once that this considerably facilitated the new arrangement of machinery, by making it possible to divide the retort-benches into two groups, each consisting of two units of reasonable size, and each having its separate installation of coke and coal handling plant. Thus in each half of the house were two sections of retorts each having its separate hot-coke conveyor, delivering to a common elevator conveyor built at right angles to the retort-stacks, and projecting through the side wall of the house. The two elevator conveyors (their positions coinciding with the intervals at the far ends of the two middle retort-stacks occupied by the two chimney shafts) are built so as to deliver their contents at either end of a single installation of coke storage-hoppers on the outside of the house, having a capacity equal to 640 tons of coke. These storage hoppers are at a sufficient elevation to deliver, through spouts controlled by gate-valves, to railway trucks placed below. The coke delivered through these spouts passes over screens fitted for the removal of breeze.

The reconstructed house, therefore, now contains forty-four



MAIN ARCHES IN THE NO. 12 RETORT-HOUSE, BECKTON (MAY 26, 1910.)



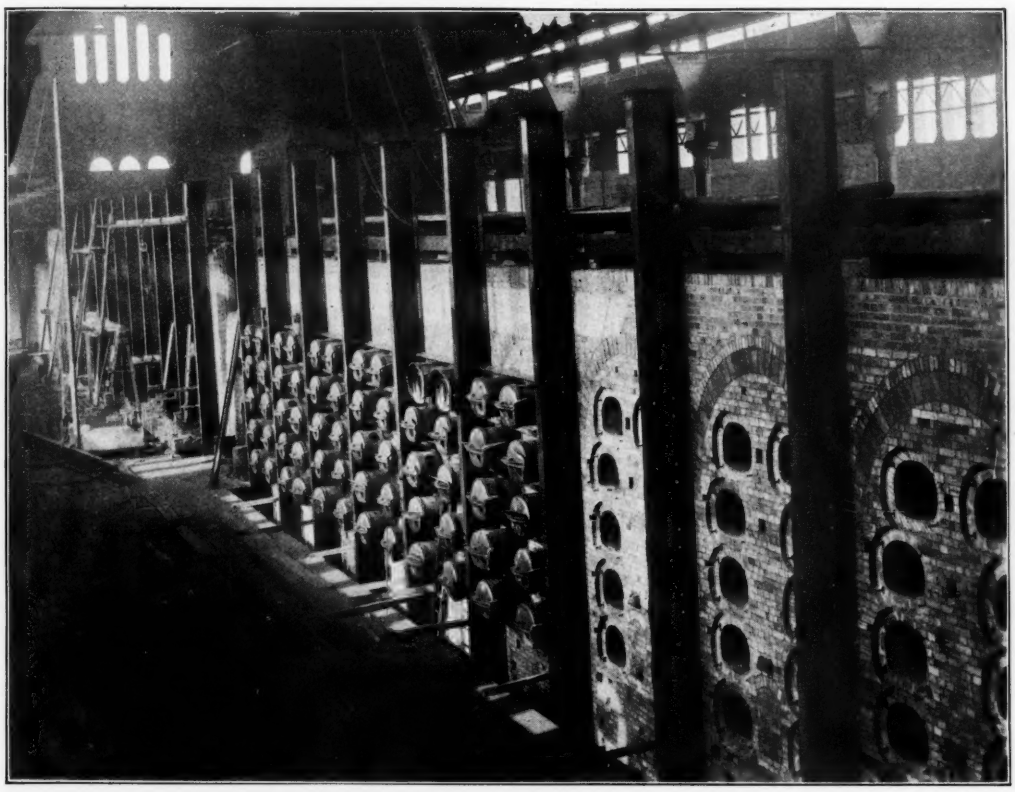
Retorts (Four High) and Combustion Chamber—Sept. 1, 1910.

settings of retorts. Each setting contains ten retorts, 20 feet long, of ∩ section with a slightly dished bottom (this being found to facilitate the pushing-out of the coke); the cross section being 24 inches extreme width and 18 inches extreme height. The carbonizing capacity of the house when dealing with eight-hour charges is 682 tons per 24 hours, equal to a daily productive capacity of about 8½ million cubic feet.

The new grouping of the retort-settings also considerably simplified the coal handling necessary, each two sections of retort-settings being dealt with, as in the case of coke, by its own line of plant. The coal is brought into the house by trains of coal trucks, each containing about 5 tons, in 90-ton lots. Each line of coaling plant consists of a twin pair of coal breakers, which are fed from a common collecting hopper, placed immediately below the viaduct on which the coal trains travel, feeding to a single elevator delivering at its upper end to a scraper conveyor by which the coal is distributed in the coal storage-hoppers from which the charging machines are fed. Breakers, elevators, &c., are of such size that the coaling of the house for 24 hours carbonizing may be effected in a single eight-hour shift. These hoppers extend the whole length of the retort-house, and are of a capacity equal to 720 tons of coal.

Power for Mechanical Appliances.

It will at once be recognized that in connection with the whole of the mechanical appliances installed, a considerable amount of power, applied at a large number of points widely distributed, is necessary. It is clearly an instance in which electricity may be employed with advantage, owing to the comparative facility with which power may be distributed through cables, rather than by means of shafting and complicated gearing. The losses incurred in the generation and transmission of the electric current, and again in the motor through the agency of which the power is applied, are, of course, considerable; and where a gas-engine can be directly fitted at the point of applying power, it is obviously the best and cheapest means of actuating our machinery. The con-



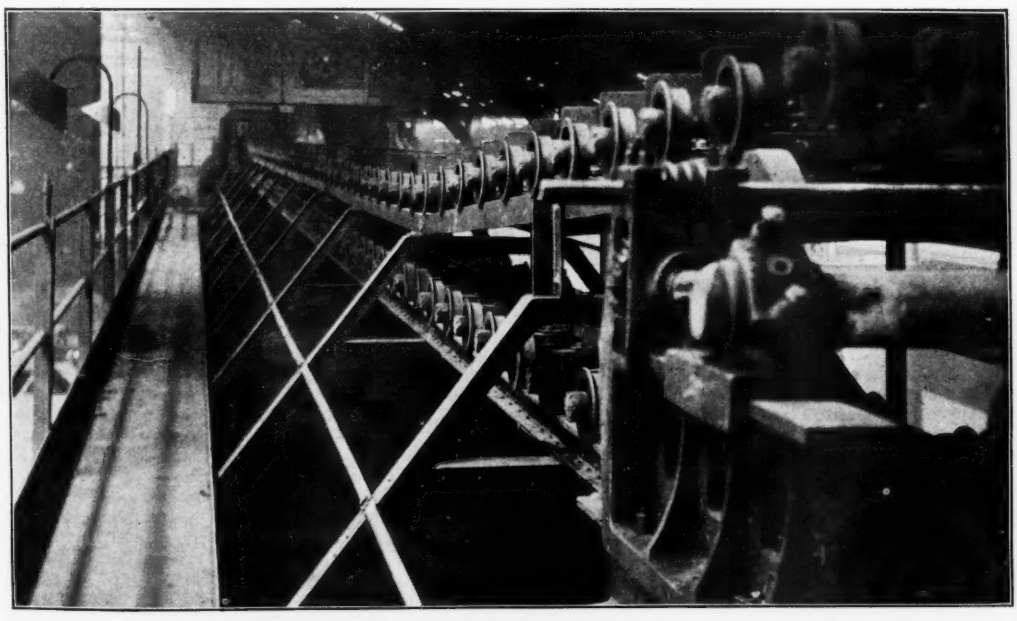
THE BUCKSTAYS IN NO. 12 RETORT-HOUSE (OCT. 7, 1910.)

ditions, however, are different where it is desired to produce the source of power at a central spot and to apply it in distributed positions. In pursuance of this view, the motive power chosen for the whole of the new machinery in the house was electricity. The current used in the house, when the whole of the machinery is in action, is equal to 170 H.P. It is generated in a central power station supplying current to the works generally, in which are six sets of generating plant direct coupled to gas-engines, altogether equal to a production of 480 H.P. per hour. Operation of the whole of the machinery within and attached to the house is controlled from a switchboard by the foreman in charge.

General Notes.

Time will not permit, within the limits of this paper, of more than the general description which has been given of the various sections of plant to which reference has been made; and it is therefore only proposed to add a few notes as to prime costs and expenses of operation.

Neither is it intended by the author to claim for the method of reconstruction employed, that, as a type, it is to be preferred to other and possibly newer methods. There is this, however, belonging to the horizontal retort—viz., that in it any coal which may be most advantageously purchased can be equally well carbonized; while in most other systems a certain amount of selection in the descriptions of coal to be dealt with must be considered. Moreover, the first cost of a horizontal installation is effected at the relative minimum of expense, so long as it is on a large enough scale to occupy the stoking machinery up to anything approaching its full working power; and, with a full working load, the economy of operating a machine is not easily beaten. Of course, where the work to be done bears a disproportionately small relation to the working capacity of a stoking machine, both the relative cost of installation to the tonnage dealt with and the costs of working are unduly increased, and different conditions arise which entirely alter the bases of comparison. The author is of opinion that no universal rule can be laid down, and that the method to be followed in every work of reconstruction must be decided on the particular merits of the individual case, bearing in mind a variety of conditions which may affect it, of which the extent of the work, the description of coal most advantageously to be obtained, and the construction of the house it is desired to refit, are only a few of the items which may be cited.



COAL HOPPERS AND CONVEYORS, AS WORKING DEC. 12, 1910.

PRIME COST AND EXPENSES OF OPERATION.

The costs of reconstruction, including the demolition of the old settings to foundation level, were as follows:—

Retort-settings, including rebuilding the main arches, refitting with structural ironwork and all fittings, mouthpieces and lids, and all accessory fittings . .	£28,440
Coal-handling plant	5,961
Coke-handling plant and storage hoppers	7,523
Stoking machinery	4,911
Power producing plant, cables, switchboards, and motors (the total power being equal to 170 horse)	3,400
Total	£50,235

The total cost of the work, therefore, for all plant was £50,235; equal to £73 12s. per ton of coal carbonized per 24 hours, or, expressed per 20 feet through retort, £114.

The costs for labour per ton of coal in operating the house are:—

Handling Coal, including tipping rom coal waggons to collecting hopper, and distribution throughout the house	1·06d.
Stage Labour.—Operating, charging, and discharging machines, opening and closing doors, and sweeping-up stage	3·67
Firing.—Filling fires, cleaning, and wheeling away ashes drawn from fires after cleaning	3·51
Coke Handling.—Coke conveyor attendance, and distributing into storage hoppers. Collecting and wheeling out breeze taken from catchpit at foot of elevator . . .	1·07
Total labour charges, excluding supervision . .	9·31d.
Power Production.—The cost of gas and stores used for generating the electric power driving all the plant connected with the house, inclusive of charges for up-keep and prime cost and allowing for losses in transmission, is equal to	1·64d.
[Labour charges for thegeneration and distribution of current allocated to the various items of coal handling, stage work, and coke handling, are included in the labour costs previously tabulated.]	

The author regrets that, owing to the house not having been in operation long enough for reliable averages to be obtained, detailed costs of upkeep of the various sections of plant cannot be given. This, however, he hopes to give at some future time as a communicated supplement to this paper. It is, however, already evident that except in the case of the coke-handling plant, upkeep will be comparatively low—from 1½d. to 2d. per ton of coal probably paying for coal handling and stoking machinery and for the electric motors allocated to this plant. The coke-handling plant is not likely to be kept in an efficient condition for less than 4d. per ton of coke; the gritty nature of the material being exceedingly detrimental in its effect on the interior steel work of the conveyors and storage hoppers.

DISCUSSION.

The PRESIDENT (Mr. T. A. Guyatt, of Ely) said they were much indebted to Mr. Goulden for having prepared the paper and the splendid set of diagrams illustrating it, and to Mr. Lacey for having read the former, and for drawing their attention to the main points on the drawings. He was afraid that it fell to the lot of but few of them to have to reconstruct a carbonizing unit of a productive capacity of 8½ millions per day, which, in itself, represented a fair-sized works; and it would be on comparatively rare occasions that they would scrap at one time a carbonizing plant of such magnitude. The paper had given a very lucid and interesting description of the reconstruction; and he should now be pleased to hear a good discussion.

Mr. A. E. BROADBERRY (Tottenham) remarked that he had listened with a great deal of pleasure and interest to the paper; and he wished to add his thanks to Mr. Goulden for having prepared it, and to Mr. Lacey for having read it. A work of this magnitude was, of course, quite unusual, and was not perhaps likely to occur in any ordinary works. But the lessons that could be learned from it would no doubt be very useful to them all. By the reconstruction, the producing capacity of the house was considerably increased; and although the number of retorts was only brought up from a total of 405 to 440, the productive capacity was raised from 5 millions to 8½ millions. He therefore took it that the yield per retort was largely increased; and probably this was due to the settings being constructed to work at the higher heats in vogue at the present time. He should like Mr. Lacey to tell them whether any special care was taken in regard to the materials that were used to deal with the higher heats which were now usually employed. With regard to the working results, he supposed that it was almost too early to ask for them; but he thought it would be interesting if Mr. Lacey would tell them the quantity of gas produced per ton before and after reconstruction, using the same kind of coal. A lot of information had been omitted from the paper. The members would have liked to have known something about the ascension-pipes, and other details of this sort. From the diagrams, it appeared that ascension-pipes were fitted at both ends of the retorts; but this was not at all clear. He should like to hear from Mr. Lacey whether he considered it was advisable or otherwise to have ascension-pipes at each end of a through setting. The method of dealing with the tar had not been described. He could not see whether the system of tar-towers had been adopted; and this he thought was desirable in most systems of reconstruction. There was a very great amount of interesting detail that Mr. Lacey could give them that did not appear in the paper. With regard to the cost of construction, he saw that the total amounted to £114 per through retort. This appeared to be rather high for reconstruction. He thought it practically equal to an entirely new setting; and he should like to hear Mr. Lacey's views on this point, as to what a new house of the same capacity would have cost per retort.

Mr. R. G. SHADBOLT (Grantham) thought that most of those present could appreciate the difficulty that Mr. Gouldon was in, in setting about the writing of his paper, in discriminating as to what would, and what would not, be useful to the majority of the members. He (Mr. Shadbolt) could also appreciate the difficulty that Mr. Lacey had found himself in that afternoon in having to interpret the paper to them. The members, of course, thought of these things and endeavoured to apply them to their own particular circumstances, and their own particular magnitude; and it was probably difficult for some of them to realize that this, after all, was the reconstruction of a section only of a gas-generating plant. Those of them who had to work a plant with a maximum capacity of 100,000 cubic feet per day or less, those who were confined to even ¼, ½, or even 1 million cubic feet per day, approached such questions as this from their respective points of view, and endeavoured to learn the lessons that contributions like this had to teach from these standpoints. One had first of all to try to get into his mind what was the smallest unit, or part of a unit, that one could take into comparison with his own plant; and as the carbonizing plant in this house was divided into four units, they got to 2⅛ millions as a minimum unit. Thus they got into more measurable distance of their own operations in regard to the proportions that one bore to another. This was a fine instance of the greatly improved use of machinery in a retort-house. Here they had an increase in the output, through the reconstruction and application of machinery, from 5 to 8½ million cubic feet, and yet there was a decrease of machines from eight to two. This was a remarkable instance of the advance that had been made in regard to the mechanical appliances in connection with carbonizing operations. The increased output, it seemed to him, had not been obtained so much from the kind of setting adopted, or from any great increase in the temperature, although there was undoubtedly some increase, as from some other cause. In his opinion, a greater factor was the increased section of the retorts. However that might be, the working results, and the financial results, appeared to be based upon an output of about 12,500 cubic feet of gas to the ton, which was good working. And when one came to look at figures such as these, he might be pardoned for doubting whether the last word had been said with regard to the relation of vertical retorts to horizontal ones with mechanical appliances. The figures Mr. Goulden had given towards the end of the paper were very striking. When they came to think that they had an installation which was working in every particular on modern lines, and obtaining the very best results, with low labour charges, and yet with an expenditure of less than £6000 per million cubic feet per day, it would cause one to think very much before going into more than double the capital expenditure as in the case of some systems of verticals, which might then only give them practically the same results. Mr. Lacey had had some experience of vertical working; and it would be interesting to know how, and to what extent, he expected the results to differ as between this particular plant and his own experience of continuous vertical retorts. Some of them found, in comparing experiences of various kinds with even hand work, that they were forced to the conclusion that labour took a great deal of displacing; and in this particular he noticed that the charges for coal handling, firing, &c., and through to coke handling, *plus* the production of power for the purpose of working the plant, came to 10·95d. per ton of coal. In his own case, with plant working up to half-a-million cubic feet per day as a maximum, he found that the corresponding costs came out, with shovel work, to 20d. But if to the figures in the paper they added 2d. for the upkeep of the plant, which was what Mr. Goulden anticipated, and 2d. per ton, which he also anticipated, for coke-handling plant, it brought the figure up to 14·95d. against his own costs of 20d., with hand labour, leaving a balance of 5·05d. to meet the greater capital charges of machine-equipped plant. There was, therefore, very little difference between the two; but, of course, he admitted that the labour conditions were different. One was impressed, more than ever that day, with the necessity of studying very closely one's own particular local conditions before involving one's undertaking in large capital expenditure on the new types of plant. As against the old hand labour stage, there appeared to be stage No. 1, which was represented by what had been placed before them that day, and stage No. 2, in which they had the application of the vertical principle of carbonization. Whether these two stages were an advantage from every possible point of view, in their own respective spheres, was a question which took a lot of settling, unless a man was exceptionally well placed to enable him to clearly come to a true decision. There was one other question he should like to ask, and that was the quantity of gas made per man per shift. He also desired especially to know how this and the vertical system compared in running costs, as well as in costs corrected for capital discrepancies. It was often said that £1000 spent on machinery would displace one man; but if £1000 would displace a man in one case, it might take £2000 to displace a man in another case. And they must remember that, by these great improvements and achievements,

they did increase capital expenditure; and this was an important question, and one of which they must not lose sight.

Mr. A. F. YOUNG (Bury St. Edmunds) pointed out that, in the case of the Glover-West plant, the cost of working per ton was given as 3·75d. Supposing they took it at a little more than was claimed—say, at 4½d., and taking the total costs given in the paper as 14·45d. per ton, this left 10d. per ton difference. If they took the tonnage of coal and a 300-day working year, this came to £8525, which would pay interest at the rate of 10 per cent. on £85,000. If, therefore, they compared this £85,000 with the £50,000 cost named in the paper, he did not know that they were actually in a better position with this plant than they would be with a vertical one. Then, if they took into consideration that they had not with a vertical plant, such as the St. Helens and other plants of a similar nature, the dirt and such-like that they had in another system where the charge was often being pushed out, this also was a consideration, and ought to help one to decide which system to take.

Mr. THOMAS GLOVER (Norwich) said there were one or two comments he should like to make on this important paper. It was a paper that strongly appealed to those of them who had had to do reconstruction work in their time. First of all, he should like to congratulate the author on being able to bring about such a reconstruction at a price of about £57 per mouthpiece. This seemed to him to be quite reasonable, if they took into account all it included. It included the continuous coal hoppers the full length of the house, and all the coal-conveying machinery that was attached to it; the coke-bunkers and the inclined conveyors on the other side of the house; as well as the Fiddes-Aldridge machines. It seemed to him, therefore, that the figure he had named was a very reasonable one. A remarkable thing about this reconstruction was that the house was 100 feet wide, which was an exceptional width; and, having so much room to spare, one wondered why the Engineer confined himself to 20 feet length of retorts—why he did not secure another 2 feet in length. With the use of machinery, they had, of course, a different problem from that which faced them when they charged by hand. In the old days, they were limited to 20 feet by the difficulty of charging and drawing by hand. But with the use of machinery, they ought not to confine themselves to 20 feet through retorts. Another 2 feet would have further helped to cheapen labour, because the additional length would have been worked with the same labour as the 20-feet retort. The inside section of the retort was 24 in. by 18 in.; and this was a good size. This probably accounted for what appeared to be the very big make per mouthpiece. The charge was 10·2 cwt. per retort; the charges were eight-hour ones; so that this gave a production of about 19,000 cubic feet per retort per day. He should like to ask Mr. Lacey if he could confirm this figure, because it was an interesting one. It showed a heavy make per retort. Attached to that was another important question. If one could make 19,000 cubic feet per retort per day, this gave 190,000 cubic feet per setting of ten retorts. But what size of furnace was required to do this work? It was a tremendous lot of work for one furnace; and to do it between pier walls 8 ft. 6 in. centres, seemed to him to be almost an impossible problem. What was the grate area of the furnace allowed, for instance, per mouthpiece? It was perhaps a bit unfair to dump these questions on to the author's deputy, who had come forward at short notice to read the paper. Possibly they were questions that could be subsequently answered by Mr. Goulden. If the paper had value, it was for reference in future constructions by other engineers. It would be most valuable from this point of view; and the information he was trying to elicit would give them other data on which to base their calculations—and most useful data too, coming from such a source. With regard to the cost of operation, one would naturally expect, with a large house like this, used (he supposed) to its full extent for the greater part of the year, that the labour charges would be low; but he ventured to think there were installations in the country that would in this respect compare with this big house, except that they had to remember that labour in London cost very much more than was possibly the case in the Provinces. The division of labour was interesting; and it was perhaps unusual. Many of them could not divide the labour between what was called stage labour and firing. In the case of this house, it was 7·18d. In his (Mr. Glover's) own case, it was 8·38d.; and the total comparative costs for house work with De Brouwer machinery, using twelve-hour charges, and putting in 13¼ cwt. of coal per charge per retort, was 9·37d., as against the 9·31d. given for the Beckton house. This might be a useful comparison to those studying the question. There were many cases in which the costs had been brought down by the reconstructions that had been carried out in recent years by the adoption of machinery. There was one point that Mr. Shadbolt had raised regarding the additional charges for upkeep. He took it the costs in the old house included tools and barrows; and when they were making comparisons of the upkeep of machinery, they should remember that coke-barrows, rakes, and tools did cost money, though not so much as coke-conveyors. But whatever the cost, it should not be forgotten.

Mr. GEORGE HELPS (Nuneaton) said the members must not let a scheme of these dimensions get on top of them. There were two simple questions that occurred to his mind; and doubtless the same questions had occurred to other members present. The first one was the effect in a scheme of this nature upon costs present and future of the kind of retorts used. He should like to hear from Mr. Lacey whether the retorts in the reconstructed house were brick ones, or retorts constructed in tubular lengths. Those who had tried the two forms would agree that, so far as maintenance was concerned, the advantages were as about two or three to one in favour of the brick retort. This was a point of great importance to most of them. Another point was in regard to the hydraulic. He did not know whether the "hydraulic" main in this case was a "dry" one, and whether a retort-house governor was used. If Mr. Lacey would enlighten him upon these points, he would be much indebted.

Mr. J. W. AUCHTERLONIE (Cambridge) remarked that Mr. Broadberry had raised a question with regard to the ascension-pipes—whether or not there was one at either end. At Cambridge, they only had one ascension-pipe per retort; and in the days of six-hour charges, they had a good deal of trouble with one. They had then horizontal retorts, 21 in. tapering to 24 in.; and, when they renewed them, they put in 24-inch parallel ones, with provision on both mouthpieces for ascension-pipes. At the same time they started eight-hour charges, and put in about 10 cwt. of coal; and now they found, with the heavier charge, one ascension pipe was sufficient. Mr. Glover had referred to a 10·2 cwt. charge as exceptional. With 24 in. by 16 in. retorts, they put in over 10 cwt. charges at Cambridge. However, the whole trouble with one ascension-pipe per retort had entirely disappeared; and they were working better than under the old conditions. He congratulated Mr. Goulden on the excellent scheme he had arranged in coke-conveyors and coal plant. It was very ingeniously designed under the limitations of the conditions.

Mr. LACEY said he was sorry he could not get the blue prints that he had with him distributed earlier, as he thought they would have cleared up some of the questions that had been asked. He had, however, no doubt that Mr. Goulden would answer anything that he (Mr. Lacey) could not reply to at the meeting. One of the questions that Mr. Broadberry asked was as to how the material used in the old settings compared with that used in the new ones. He believed he was correct in saying that the cross walls of the settings and the combustion chambers were built of Ewell brick. In the old days, they did not use such a refractory material as Ewell. The retorts were composed of the usual Stourbridge mixture; and, from personal observation of the retorts, he could say that they were in excellent condition, and were wearing very well indeed. Therefore, he had no hesitation in saying that the particular setting adopted in this case had, to his own knowledge, been quite satisfactory. Mr. Broadberry had asked for the results obtained before and after reconstruction. It used to be considered, on six-hour work, that about 10,400 or 10,500 cubic feet of gas per ton, or approximately 6000 cubic feet per mouthpiece, was a good result. He had not the figures from Beckton as to the present make, beyond those that appeared in the paper. But a make of 19,000 cubic feet per retort, or 9500 cubic feet per mouthpiece had been mentioned; and he had not the slightest doubt that this figure could be fairly obtained from these settings. Then Mr. Broadberry raised the question as to whether there were ascension-pipes at both ends of these settings, or only single ones. With settings of tens, it was very difficult to fit in ascension-pipes at each end. There was only one ascension-pipe on each retort, with, he believed, the exception of the top retort, where there were two. The pipes were 7 inches in diameter. As to the point regarding the hydraulic mains and tar-towers, the system was to use a hydraulic main with a seal and tar-towers to about every three settings. The hydraulic mains were detached every three settings—they were not continuous; so that any alteration in the level in any one length did not affect the next ones. Each section of hydraulic main over three settings had its own tar-tower. This, of course, meant a large number of tar-towers, which were situated on the side opposite from the motor. As to the question put by Mr. Broadberry respecting the cost of construction, that would have to be left to Mr. Goulden to deal with, because he (Mr. Lacey) had not been personally concerned in this reconstruction, and so was not familiar with the figures needed to deal with the point. Mr. Shadbolt had referred to the question of the size of the unit, when reconstructing, as affecting the character of the reconstruction, and also the possibility of saving money. He pointed out that this reconstruction, although a large one, could be sub-divided into different units; there being four sections, and that one or two of them could be applied to a scheme a quarter or half the size of this one, and that the same proportionate cost might be expected to be incurred. He (Mr. Lacey) did not see why the work should not be used in this way. The figure would not alter much, excepting that the coal and coke handling plants were only divided into two sections, and not four. Mr. Shadbolt raised the question of the possibility of using vertical retorts as against horizontal ones; and he quoted certain costs with which he was familiar in his own works. If one were to go into the question of vertical retorts for this house, one would have to take into consideration the site and the distribution of the coal and coke, as well as other questions which did not directly arise on the paper. It might, of course, be advisable, and even preferable in some place apart from Beckton, to put up vertical retorts. This, however, would not be the spot that would be an economical one for them. Anyone familiar with the general arrangement of Beckton would, he thought, agree with his personal opinion (it was not for him to say what would be Mr. Goulden's opinion) that this site was not the best one for vertical retorts. In another place, with more suitable conditions, his opinion might be just the reverse. As to the relative costs of verticals and horizontals,

Mr. Goulden came to the conclusion that the cost of the former would be considerably more than the latter; but he (Mr. Lacey) rather fancied there were other considerations than cost that influenced him in this instance. Mr. Shadbolt also went into the question of the cost of labour—comparing the costs with which he was familiar with those of the Gaslight and Coke Company. There was one thing in regard to this scheme, and it was that there had been a very large saving in labour costs; and had they been under the happy circumstances of some of their friends, there might not have been the same inducement to spend this money. In their own case, they could not possibly reduce the cost of labour, excepting on the old conditions; and a saving had been effected by the reconstruction, which they were perfectly certain had been justified. He agreed that the particular system one should adopt in any scheme of reconstruction should be a matter of anxious consideration; and the person best able to determine this was, generally speaking, the manager of the works, who was familiar with all the details of manufacture in the particular works. Mr. Helps had made some observation which he was sorry to say he was unable to get down quickly enough.

Mr. Helps observed that he simply asked as to whether brick or tubular retorts were used, and as to whether hydraulics, or dry mains, were employed.

Mr. Lacey replied that the Company did not use brick retorts at any of their works. They employed nothing else but tubular retorts. He was quite aware that opinions were changing as to the advisability of having built retorts; but the tubular retorts used in this particular case had worked exceedingly well. The mains were not dry ones. Mr. Glover, of Norwich, had asked a question which he (Mr. Lacey) thought was a very interesting one—as to why, when using machinery, they still confined themselves to 20-feet retorts. The question bore to an extent on the point as to foundations, which on this site had to go down 20 feet or so; and this, of course, was an important consideration in altering the length of the retorts. There was also the question as to the position of the columns in the house; and another one as to limiting the available space on the charging-stage.

Mr. Glover: You have no machine on the coke side. There is plenty of room there.

Mr. Lacey (continuing) said if the settings were carried further out on one side, it would necessitate the foundations being extended and to a depth of 20 feet. He did not, however, know what Mr. Goulden would say to the proposal. Personally, he did not see that it was quite feasible, though, of course, it might be done in the future. Mr. Glover also raised the question as to the grate area in these settings. To that Mr. Goulden would also possibly reply in writing. Mr. Glover further alluded to the cost of operating his De Brouwer machine as compared with the Fiddes-Aldridge machine; and he thought that Mr. Glover's opinion was that his cost was lower than in this case. He believed that the figures were 7⅛d. for Norwich, as against 8⅝d. for Beckton. He (Mr. Lacey) was quite prepared to hear that the cost of the De Brouwer machine would closely approach the figures in the paper—in some cases it might even be dearer; in some cases, a little cheaper. It was a system that could be worked to advantage, especially, as he believed Mr. Glover worked it, on twelve-hour charges. The figures in the paper were for eight-hour charges. If they worked twelve-hour shifts, the figures would have been lower. There was no doubt, too, that Mr. Glover got very good working. On the point as to one or two ascension-pipes per retort, it was interesting to hear Mr. Auchterlonie's experience as to, with one ascension-pipe per retort, trouble having ceased with the increased weight of charge. The question was of some interest as bearing upon the cause of stoppages. He (Mr. Lacey) had no hesitation in thinking that increasing the mass of the charge had a tendency to reduce pitched ascensions. He was sorry that he could not give a more effective reply to the discussion; but his excuse was that his connection had not been with the reconstruction, but with the earlier work that had now been demolished.

MR. GOULDEN'S REPLY.

Since the meeting, a copy of our report of the discussion has been submitted to Mr. Goulden; and he has sent the following supplement to the reply made by Mr. Lacey:

With respect to the discussion on my paper read at the Eastern Counties Association meeting, Mr. Lacey in his reply has already dealt with most of the points raised by the gentlemen contributing remarks; but a few matters still remain untouched upon. With regard to the details referred to by Mr. Broadberry, I would note that the retorts now set are of a cross section 24 inches by 18 inches, replacing 20-inch by 13-inch retorts—permitting of a considerably increased charge. I intentionally abstained from details when writing my paper—confining myself to the general rearrangement of the house, as one method of working out an interesting engineering problem. I disagree with Mr. Broadberry in considering the cost of reconstruction as high. On the contrary, I look upon it as decidedly low. The cost of £114 per ton per day includes previous demolition, necessary structural work in the house itself, and both coke and coal handling plant. It would have cost no more—rather less—to have installed the same plant in a new house. To have put in vertical retorts with the same ancillary plant would have cost at least 40 per cent. more; and I am not inclined to the belief that they would have been worked at more than slight, if any, advantage over the costs of working the existing installation. The first cost of the installation must be taken into account in any general comparison, no matter what the system may be. But whether the one or the other is the more advantageous is, as Mr. Shadbolt remarked, very much a matter of local conditions. The advantage to be gained from machinery depends on the relatively full use which can be made of it. With a disproportionately small load, its benefits fall away until they are likely to disappear altogether. In the installation I have described, all the machinery is worked at an economical load—using something approaching its full power. This condition is all-important; and a reversal of such conditions would make the use of machinery a thing to avoid rather than adopt.

In the present case, I have no more doubt that the reasonably best solution of the problem was what has been done than that under different local conditions it would have been quite wrong. I have recently visited more than one works fitted with vertical retorts, and under their particular conditions I cannot imagine any system more perfectly calculated for excellence of results. Mr. Shadbolt's figures of comparison need a little revising; and it is well to realize that my figures of cost for operation include the placing of coke into elevated receptacles, from which it is supplied to the purchaser merely by the opening of a valve. They also include the placing of the coal into store. The figure of upkeep for the coke-handling plant—4d. per ton of coke dealt with in the coke-hoppers—is equivalent to 2d. per ton of coal dealt with in the retort-house. His figure of 8d. per ton of coal for Beckton working must, therefore, be reduced by 6d. I do not follow Mr. Shadbolt in his references to £1000 spent upon machinery displacing one man; and I would not, as the author of the statement put it, spend £1000, if by doing so I could replace one man. It would not be a reasonable proposition; and, of course, it would be less so to spend £2000 for the same purpose.

Mr. Glover's remarks are very much to the point; and his suggestion of a 22-feet retort was, I may say, considered when designing the new setting. Although the retort-house is so wide, however, it includes coal-stores between the retort-stack and its side walls; and structural details in the shape of columns carrying the roof, stage, &c., forbade the introduction of a longer than 20-feet retort. There is no difficulty in obtaining excellent heats in the settings, the furnaces of which have a grate area of some 18 square feet. Their effective area—that is, the area of the interior of the furnace—is in excess of this by fully one square foot per mouthpiece.

Mr. Helps' inquiry as to brick retorts reminds me that at one of our stations, a few years back, after the introduction of machines into our retort-houses, the carbonizing results from a particular house fell away seriously. After examination, it was found to be due to the bricks used in the retorts at the works in question being loosened from the interior, doubtless by the use (or possibly the misuse) of the machine rake when lifted to pass over the charge of coke lying in the retorts. The strength of the retorts was, of course, in resisting pressure from their exterior; and the replacement of brick retorts by tubular sections put matters right. The life of the brick retort is, I fully recognize, far longer than that of the moulded clay retort. But after all a sound retort is what we must have; and our experience shows that with powerful machines striking against the interior surface of the retort, it is impossible to keep a brick-built retort tight for any lengthy period of time.

I should like, in conclusion, to express my thanks to Mr. Lacey for his kindness in consenting at short notice to take my place in reading my paper, and for dealing so fully with the points under discussion; and I would also take this opportunity of thanking the President and the members of the Association present at the meeting for their kindly courtesy extended to Mr. Lacey, acting on my behalf, in my absence.

Corrosion of Iron and Steel.

At a recent meeting of the Faraday Society, a paper on "An Electrolytic Theory of the Corrosion of Iron and Steel" was read by Mr. Bertram Lambert. There was a general discussion on the subject of the corrosion of the two metals named; and it was shown that a simple and natural development of the ideas of Faraday on electrolysis will give the foundation of a satisfactory theory of the corrosion of iron. Mr. Lambert pointed out, according to the "Chemical Trade Journal," that commercial iron is always heterogeneous in character, and that when a piece of such metal is placed in an electrolyte like water the electrically different parts tend to set up an electric current between them, with the passing into solution of the metal at the relatively electro-positive points. Oxygen probably plays two different and distinct functions in the rusting of iron: (*a*) It helps the iron to pass into solution in the water by electrolytic action, probably by oxidizing the film of hydrogen at the electro-negative points. Since iron only goes into solution by the passage of an electric current, so long as this film, which is formed the instant the iron is put in the water, persists, no appreciable quantity of iron can dissolve. (*b*) The oxygen produces ferric hydroxide (rust) from the dissolved iron. The ferrous ions produced when the iron passes into solution cannot be oxidized to ferric ions by molecular oxygen. They first combine with the hydroxyl ions, always present in water, to form undissociated ferrous hydroxide, and this is then oxidized to ferric hydroxide by the oxygen. The properties of chemically pure iron were shown to give very substantial support to the theory.

BURNERS.

By W. Orme, of Woodbridge.

[A Paper read before the Eastern Counties Gas Managers' Association, April 24.]

Burners are, it may be said, the ultimate end of all gas manufacturing and distributing operations; and our aim as an industry (a great and indispensable industry) is to provide the best possible burners for light, heat, and power.

While giving to the title of this paper such a full interpretation, your minds were, probably at the onset, turned to burners for lighting—for illumination; and we have reason to be proud and confident of our position in this regard; we may be guilty, indeed, of producing gloomy shadows in the minds of our electrical friends. But with this exception, our business is to carry light, warmth, and comfort into the homes and habitations of the people; and to this end we are on the look-out for the apparatus best adapted to these purposes. I think all present may be said to know that coal gas can be burned so as to produce a flame of more or less luminosity by means of what is sometimes now called an "ordinary" burner. In a few years' time, that knowledge will only be a reminiscent memory possessed by the patriarchs of such a society as this!

Past and Present-Day Requirements.

Much of my early time in the industry was spent in trying to persuade consumers to go in for "Bray's Specials," or "Sugg's Governors," or at any rate to have their "nibs" changed once in six months. But what a job it was! Six years was more like the ordinary unattended life of a burner in those days! What we seriously need to-day, is an "ordinary" burner. All burners now are, or should be, of the bunsen type; and in talking of the Welsbach light, let us not forget this fact. With the bunsen burner only, our industry has an immense field of usefulness; in conjunction with the Welsbach mantle, this field is immeasurably increased.

Such has been the march of events within recent time that, in speaking of burners, we should almost naturally picture an inverted burner. While paying tribute to the genius and ingenuity which have been devoted to the production of such burners, I must confess that the profusion of patterns and makes now on the market is in the nature of a nuisance. Some burners are well made, and have good points. But is there one to be had which combines all the best features, together with accurate workmanship? One may have a well-designed adjuster, but which is cheaply made, and hence defective; another has an efficient mixing arrangement, but is hopelessly difficult to dismember after short service. Perfection has still to be sought.

In common with all bunsen burners, the simple essentials of an inverted burner are a gas-nipple or injector, and a tube with suitably placed air-ports terminating in the burner-head. In addition to these, we require means for carrying a mantle; and, last, but not least, the mantle itself. An inverted burner should be capable of generating the full heat of combustion in the smallest possible compass—in other words, should have a high temperature flame which will burn in the mantle without crackling or spluttering.

Accurate Construction.

In the construction of a burner, the first point to be asked for is extreme accuracy and good workmanship. Next it must be simply arranged, so that not only the fitter or maintenance man, but the user also, can easily take it to pieces—and put it together again. There are some burners which, unscrewed in one part, fall into a dozen pieces; others cannot be unscrewed, while among the best of them are found nipples, speed tubes, and other parts through which the gas must pass, with rough unfinished edges. I have just had occasion to try a burner, of very good make, from which I could get no sort of bunsen flame. Investigation showed that the only defect was in the small speed tube, which had been cut off rough, and the bottom edges turned inwards, presenting a rough shelf to the downward flowing mixture. This remedied, the flame was perfect.

The Injector Nipple.

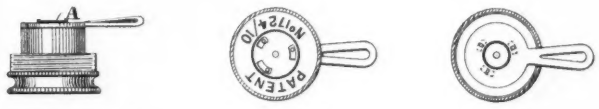
First in order of the parts of a burner comes the injector-nipple, which, to be generally useful, must be adjustable; and it is here that many burners signally fail. Even if capable of effecting the required adjustment at the start, they become in a short time permanent fixtures. Spring-actuated adjusting needles are to be condemned. The needles which are worked by means of a lateral screw, with doubled-coned end, are good; but the screw is liable to give trouble. A simple screw-in needle, where it can be utilized, is good; but its use is confined to the angle-burner.

I have before me three extremely simple, direct-acting, and very effective adjusters.

No. 1 has a fixed central aperture of limited area, and three slots of a varying size. To this nipple-block face is closely pivoted a plate having three small holes, which will register with the three slots; but, owing to the varying length of the slots, on rotating the plate by means of the handle, these holes will be covered or uncovered in rotation—thus enabling the fixed aperture to be augmented by either one, two, or three of the others.

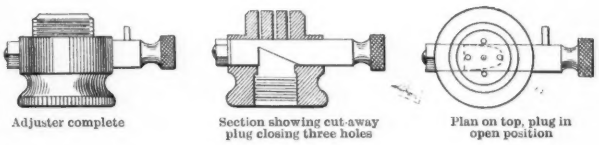
No. 2 has five holes, two of which are fixed, and three are in line with the axis of a plug, part of the periphery of which is cut away, and which, in one position, completely closes them, but on rotation will uncover them one after another. It is thus possible to have either two, three, four, or five holes in action.

For vertical inverted burners, I consider No. 3 to be the best adjuster I have met. It is substantially made and positive in action. The needle is formed on the end of a small pipe which constitutes the gas-way to the nipple. The nipple-block is separate, and screws on to this needle gas-way. When in position, about a three-quarter turn of the block will vary the position from full open to closed. A small screw in the side serves both as a handle for adjusting and for fixing in position when proper adjustment is found. This adjuster may well form the basis of a really good burner; and if we can add to it a Venturi bunsen tube, with air-ports of ample area and convenient of regulation, terminating in a small mixing chamber of simple parts, and a good magnesia nozzle, we are nearly ready to do justice to the mantle. But means must be provided for deflecting the products of combustion from the air-chamber—and, incidentally, from the fitting to which the burner is attached—and also for the attachment of a globe or shade. If the globe could be provided with a gallery for attaching to, or lifting on or off, the burner in a similar way to the mantle, it would be a boon to the housewife or maid.



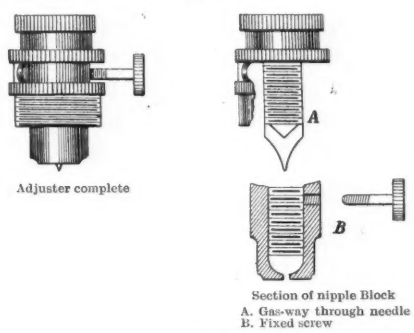
A. Boss to which plate is pivoted. Adjuster complete. | Plan underneath showing slits | Plan on top

No. 1.



Adjuster complete | Section showing cut-away plug closing three holes | Plan on top, plug in open position

No. 2.



Adjuster complete

Section of nipple Block
A. Gas-way through needle
B. Fixed screw

No. 3.

Mixing Chambers.

There has been much ingenuity applied to the production of an efficient mixing chamber, and there are burners in which, by imparting a rotary motion to the gas-air mixture (which motion may even be seen in the helical form of the inner cone of the flame) a very high flame temperature is attained, with resulting high candle power per unit consumption. But complexity of construction leads to inefficiency; and we can afford to sacrifice a little to simplicity and regularity of action. A mixing chamber of (say) ¾ inch space, simply formed by an enlargement of the tube, with two spheroidal gauzes fixed in the chamber like the two ends of an egg, gives excellent results, prevents lighting-back, and is no trouble.

Swan-Neck Burners.

Burners of the swan-neck type are extremely efficient, simple of construction, and, if well made, give great satisfaction with the minimum of maintenance trouble They can be used on upright fittings, or even made to harmonize with inverted fittings; and they possess the advantage of discharging the products of combustion clear of the fitting. The length of tube stands in place of the mixing chamber. Those with long stems for street-lamp work, requiring no adaptation of the upright lanterns, are hard to beat for this purpose.

High-Power Low-Pressure Lamps.

I have had some experience with the latest high-power low-pressure lamps; and this experience makes me wonder whether high-pressure is necessary. There are lamps and burners of this type now on the market which are extremely reliable and steady in action and results. The adjusting arrangements are effective, and one can only say avoid the flimsy ones and keep up

the standard. I do not see why there should not be even a further increase in the size of mantle for this class of lamp.

Self-Lighting Mantles.

With regard to mantles, I only wish to draw attention to self-lighters. I have had these in use since the autumn of 1910 for the lighting of the lecture hall at Woodbridge, on a six-light Graetzin burner pendant, where the burners are about 15 feet from the floor, with, I consider, very satisfactory results. During the last six months, I have fixed them in other places, and used them at home. At the time of writing, the latest installation, on eight two-light Graetzin outside lamps, is still working well. They were fixed six weeks ago, and have required no renewal or attention. The bye-passes were removed from the lamps. I think it would pay us to take a little interest in this neglected child. It has occurred to me that the igniting medium might be made a part of the burner nozzle, where, lying out of the zone of fiercest heat, it would last longer.

When I promised to write this paper, I had a much more comprehensive one in mind; but I hope I have said enough on which to base a good discussion. My first and last word on burners is —refuse cheap and flimsy productions.

DISCUSSION.

The President (Mr. T. A. Guyatt, of Ely), in inviting discussion, said he quite endorsed Mr. Orme's general conclusions. With regard to the self-lighting mantle, he had not personally found it a success. In his case, it failed to act regularly. He did not know the reason, but anyway he discarded it.

Mr. W. B. Farquhar (Ilford) said the paper was on an important subject; and it was a very important one, owing to the fact that the burners were used on the district, and away from the engineer's control and supervision—in other words, there were troubles with burners at points which they were not aware of unless they were informed of them. If anything went wrong on the works, the engineer was there to see what had taken place, and to put it right. Some consumers, when they were troubled with their burners, were negligent in informing the gas company, or in trying to remedy the trouble themselves. In such cases, one result might be the loss of a consumer to the electricity suppliers. Therefore, it was important to have burners as perfect as it was possible to make them. The author had treated the subject in a somewhat different way from what he (Mr. Farquhar) had expected. However, regarding the testing of burners, in order to get the best results, one had to be careful, when making tests, to see that the same mantle was used, or, at any rate, the same type of mantle. The same remarks applied to testing mantles—that it was always advisable to test different mantles with the same type of burner. Another point made by the author was with regard to low-pressure high-power lamps; and he suggested that it was a question whether high-pressure was now necessary. They could get almost anything from the low-pressure high-power lamps; it all came to a question of the quantity of gas consumed. There was practically no limit to the amount of light they could get. They could make the nozzles as big as they liked, and the mantles as large as they liked; but it all came down to the efficiency per cubic foot of gas consumed. While the shopkeeper was attracted by the amount of light given by a lamp, where it affected him most was in his pocket; and there the question of the lighting efficiency in relation to the consumption of the lamp came in. He should like to ask the author whether he had a figure which gave the efficiency per cubic foot of gas consumed for the low-pressure high-power lamps. With the types of high-pressure lamps on the market, one could get about 60 candles per cubic foot of gas consumed. The question might be raised, that the difference between the low-pressure lamps as compared with the high-pressure lamps was in consumption counteracted by the cost of running the compressing-station, which might be a serious item where they only had a limited number of lamps. If the installation was of any size at all, and a growing one, every addition to the number of lamps naturally reduced the charge, because the running of the machinery and attendance was the same throughout. Then the author had not touched upon the subject of the actual use of the burners in the consumers' houses or other premises. He had confined his remarks to the construction of burners. Perhaps, therefore, he (Mr. Farquhar) was going beyond the scope of the paper in making the following remarks. Regarding the consumers themselves, and the maintenance of their burners, some gas companies maintained burners at a fixed charge; some maintained them without cost and made a fixed charge for materials used; while others made a small inclusive charge which might almost be reckoned as *nil*. At Ilford, they made a charge of 7d. per burner per quarter; and this included cleaning at intervals of a fortnight or three weeks, and the supply of mantles and chimneys.

Mr. R. G. Shadbolt (Grantham) remarked that the author stated that an inverted mantle should be capable of generating the full heat of combustion in the smallest possible compass. He would suggest that regard should also be had to the fit of the mantle to the flame, because they might concentrate their flame to such a small compass that the mantle would be larger than the flame, and then literally they would be getting no light at all. At the beginning of the paper, Mr. Orme said the duty of the industry was to provide the best possible burners for light, heat, and power. There was some disappointment on reaching the end of the paper; for instead of treating of burners for light, heat, and power, the author confined himself almost entirely to lighting burners. Then he left the members in an unsatisfied frame of mind by saying that he had had in view a much more comprehensive paper. That being so, if Mr. Orme had some more useful information in regard to burners for other purposes than lighting, perhaps he would reconsider the matter, and at a future time let them have the comprehensive paper that he had in mind.

Mr. C. D. Banham (Wymondham) said with magnesia nozzles he found there was a certain danger with them from fire. He had known instances of nozzles breaking in inverted burners, and the hot pieces falling through the mantles. In fixing burners, if he saw any danger of this, he always put in a brass nozzle. In his own house, he had had a nozzle break, and the pieces fell on to the table cloth and burnt holes in it.

Mr. George Helps (Nuneaton) said he had listened to the paper with great interest. Mr. Orme had dealt with the bunsen burner, and had omitted a good deal of detail. He (Mr. Helps) had spent ten years on the bunsen burner, had spent £10,000 on it, and yet did not know anything about it to-day. [Hear, hear, and Laughter.] He thought their troubles in this regard would be removed altogether before very long; and that there would be no more difficulty with nozzles. They would have the gas and air mixed for them, as Mr. Franklin Thorp told them; and it would simply pass into a plain tube. But they had not got to that stage yet. Mr. Orme thought there were on the market a lot of bad burners. There was no doubt about that; and there was no doubt, too, that there were a lot of bad users. People used burners who knew absolutely nothing about them; and for a number of years gas engineers had, he thought, considered it *infra dig.* to know anything about them. So long as this was the case, there was bound to be trouble. When these gentlemen interested themselves in the essentials of good gas lighting, then perhaps they would go a little faster ahead. Mr. Orme was in favour of an adjustable nipple. An adjustable nipple might be all right; but what was the use of one that was out of reach. Then the author went on to talk of low-pressure high-power burners. He was entirely at one with him there. He considered the question of high-pressure lighting was being carried too far. He daresay there were other members present who had noticed that with the ordinary low-pressure street-lamp the lighting effect was not nearly so marked as was that of the high-pressure lamp. When they touched on this subject, they got on to efficiencies; and he had not yet heard anyone say what was the efficiency of a low-pressure high-power burner as compared with a high-pressure one. He had tried to discover this for a long time past, and had failed. If Mr. Orme had any such efficiencies, they would be most interesting. He did not know that he agreed with him when he said that they could still further increase the size of the mantle. They were, he thought, inclined to go to extremes in that direction. He (Mr. Helps) was interested to learn of Mr. Orme's success with the self-lighting mantle. If they could discover a satisfactory self-lighting mantle, they would have trouble removed, an end to the bye-pass, and the electric light would be set farther back than it was now. Perhaps Mr. Orme would tell them as to whether he had found this self-lighting mantle satisfactory in the atmosphere of a room when particularly dry, and in the moist external atmosphere. He had tried self-lighting mantles, and was most interested—in fact, he thought he had the golden key. But he could never make anything of them.

Mr. Orme, in reply, said that at Woodbridge he had no means of testing the actual efficiency of low-pressure high-power lamps. But not long since he was with a friend who was a gas manager; and they drove through a town where there was high-pressure lighting, and then they came to Woodbridge where there were some low-pressure high-power lamps. His friend said he considered the effect of the latter was better than that of the former. The makers claimed for the low-pressure high-power lamps 40 candles per cubic foot of gas; but while they must discount this to some extent, the fact remained that they did get a high efficiency from the lamps. He agreed with what Mr. Shadbolt said as to the flame fitting the mantle. With regard to Mr. Banham's remarks, he (Mr. Orme) mentioned the magnesia nozzle simply as a type of heat-resisting nozzle; but he must say he had not had the troublesome experiences with them that Mr. Banham appeared to have had. As to self-lighting mantles, he had had increasing experience of these in Woodbridge. In an outside installation, they had been running now upwards of two months; and they had not been called upon to renew any of the mantles. Some of them, however, were now getting sluggish. Several of his consumers found them very serviceable in their houses; and he thought the mantles had now reached a stage when they ought to be encouraged. With regard to the incomprehensiveness of the paper, he need not apologize, as the time that could be devoted to it at the meeting had been short.

According to the inventory, the estate of the late Sir William Arrol amounts to £316,589, on which the estate duty paid was £34,741.

Among the awards made by the Council of the Institution of Civil Engineers for papers read and discussed during the session 1912-13 is a Watt Gold Medal to Mr. H. A. Humphrey, for his communication on "The Generation and Distribution of Producer Gas in South Staffordshire," some extracts from which were given in the issue of the "Journal" for the 17th of December last (p. 897).

THE TECHNICS OF THE ASCENSION-PIPE.

By Edward G. Stewart, of the Gaslight and Coke Company.

[A Paper read, with Blackboard Sketches, before the London and Southern District Junior Gas Association, April 25.]

Introductory.

It was the author's privilege to present to the Association during the 1911-12 session a paper entitled "Carbonizing, with Special Reference to High Makes." A desire to dip further into the detail of matters therein referred to, directed by circumstances connected with his professional duties, led the author to promulgate an investigation into the question of the ascension-pipe, its action and "inaction." The problem proved to be of quite fascinating interest, and the author in all modesty considers the results and deductions made to be worthy of your consideration, and trusts sufficient food for discussion will be found, and those problems left unsolved thereby elucidated, wholly or in part.

Mass and Layer Carbonizing.

The modern carbonizing processes, though accomplished in so many and such various methods, may be divided into two main divisions of different fundamental principles, which may be designated "mass" and "layer" carbonization. Under the former are included chambers, vertical retorts (of any type extant), and horizontals or inclines with full charges. Under the latter, horizontal and inclined retorts working with light or medium charges. The salient and distinguishing feature of the layer system is, so far as the volatile products are concerned, the free space above the charge. Here the issuing gas becomes baked and cracked-up by the radiant heat from the crown of the retort, and deleterious products—such as free carbon and sulphur impurities—are produced; while the breaking-up of the light oils causes more naphthalene deposition in the plant.

Characteristics of Gas Evolved in the Two Systems.

While the temperature of the gases leaving the retort in the layer system is some 600° to 800° Fahr., in the various mass systems it is only some 300° to 450° Fahr. Further, in all layer systems there is a much lower percentage of tar oils condensing at a comparatively low temperature than in the mass methods; while free carbon, and hydrocarbons and other organic compounds with a high carbon percentage, are present in appreciable proportion, consequent on the cracking of the tar vapours found in mass systems into carbon and hydrogen.

It is this hydrocarbon degradation which constitutes the fundamental principle, and in many ways the curse, of the layer system. The extremes of these two systems may be taken as a very light charge—say, one-quarter the depth of the retort—and the charge absolutely filling the retort. Intermediate stages in the size of the charge give results in proportion as the size of the free space is varied.

Retort Temperature.

The influence of the retort temperature itself is shown in two ways, both of importance to the pipe question. Firstly, as a proportionate rise or fall in the temperature of the issuing gas; and, secondly, in the amount of hydrocarbon degradation occurring in the free space. Except in small works, it can be assumed that present-day carbonizing is carried on with temperatures of from 1600° to 1900° Fahr. in practically all systems—the duration being varied to suit the weight of charge; so that, while a high or comparatively high temperature is more or less imperative, there is always at hand the means to combat its disadvantages, by varying the weight of charge and the duration.

Leaky Retorts.

The final influence in the retort is the effect of holes, which, under the vacuum usually prevailing in the retort, permits the entrance of permanent gases from the setting at the temperature of some 2000° Fahr. While increasing the volume of the gases leaving the retort, they also often raise their temperature to over 1000° Fahr.

Condensation in the Pipe.

The construction and disposition of the ascension-pipe will, of course, be familiar; and, further, the remarks following will (unless otherwise stated) refer to the long vertical pipe associated with horizontal and inclined retorts, and not to short horizontal take-offs, such as are applied to verticals.

On leaving the retorts, the mixture of permanent gases and vapours is at once subjected to cooling; the dull black surfaces of the mouthpiece and pipe rendering them efficient radiators. Normally, by the time the gas reaches the bridge-pipe, its temperature will have fallen to some 200° Fahr.; a minimum of 100° being reached towards the beginning and end of the charge, and a maximum of 270° about the second hour. As a result of this, some of the tar vapours will have been condensed—the heavier oils near the bottom and the lighter ones higher up. Again these oils will tend to run down the pipe interior, and upon reaching a zone where the temperature of gas and iron is higher will become redistilled, and rise only to be again condensed.

Steady Flow.

With a uniform flow of gas, this condensation and redistillation takes place evenly; and, given suitable conditions, the surplus tar will run to the mouthpiece and clear the pipe as the quantity of gas passing slacks-off towards the end of the carbonizing period, and if not entirely discharged will collect at the entrance to the pipe, and be removed when the pipe is tried. This state of affairs in nearly all cases will be found where the retorts are worked with high temperatures, but quite full, and also with light charges and low temperatures.

Intermittent Flow.

Should, however, the seal be heavy or the vacuum short, or, again, accumulations of thick tar occur beneath the dip—in any of which cases it is necessary that a pressure occur in the pipe before the gas can be released—the period during which the condensation can take place is prolonged, and a greater quantity of tar will be deposited, and so may not clear itself before the time comes to recharge the retort, especially with a long pipe. In this case, the quantity of tar in the pipe will gradually increase, and lead to a blockage. It is obvious, therefore, that as far as possible a steady and rapid flow through the pipe—engendered by light and even seals, a uniform and sufficient vacuum, and clean hydraulics—should be aimed at.

Temperature of Gases.

The temperature of the gases entering the pipe plays an important part in its working, in determining the lowest region that a tar sufficiently fluid to run can exist. With mass carbonization, the pitchy tar will not be volatilized even at the entrance to the pipe; but as soon as the gases rise over some 500° Fahr., the pitch is again distilled; and so a zone exists in the pipe below which none of the tar can sink. As a result, an accumulation occurs here; and practical experience proves this theory in the fact that the higher the temperature of the issuing gases, the nearer the bridge are the blockages in the pipes found.

Formation of Deposits.

The blockages from this cause take the form of a plug of pitch, often 2 or 3 feet long. They are formed by the falling-in and cohesion of a ring of pitchy tar which has collected at one of the "critical zones." Supposing, however, before the pitch-ring has closed-up, an excessive vacuum is put upon the retort, a blast of hot gases is drawn up the pipe and, partially carbonizing the ring and any tarry matter inside the pipe lower down, a stoppage in the form of hard scurf, often 2 or 3 inches thick, takes place.

The existence of the free space renders the high temperature layer carbonization of to-day peculiarly liable to pipe troubles—from another cause—that of the free carbon carried in suspension. This may be either caught-up by the thick tar and render it thicker, or else, as often happens, be deposited by momentum in turning the sharp corners of the arch-pipe, and produce a powdery deposit. A dusty coal will often produce a similar effect; the dust being mechanically carried up, during charging, and also caught up by the gas from the coal in the mouthpiece and the charge in its pre-pasty condition.

Various other combinations of these deposits are frequently found—pellets, rubbery pitch, &c.; but their cause in all cases can be discovered, though unfortunately circumstances do not always permit of the evil being remedied.

Special Local Conditions.—One or Two Pipes.

These local circumstances range over a variety of causes; and a consideration of a few of the more important will not be out of place, if only to show the complexity of conditions surrounding the action of the pipe or pipes.

It is a fundamental, and as yet unanswered, question whether there shall be one or two pipes to the retort. First, as to necessity. In the case of filled retorts, it is quite impossible to get the gas away with one pipe, as a heavy pressure is experienced on the blank side. With other systems, the free space being large enough to carry away the gas produced, the need for two pipes is not insistent.

So far as cost is concerned, obviously a duplication of mouthpiece with pipe holes and flanges, and ascension, arch, and dip pipes, which are necessary, together with the possibility of doing away with the hydraulic on one side, give the one-pipe system an advantage. The final decision, therefore, becomes one of working advantages.

It is said that the increased travel of the gas in the free space with one pipe results in increased gas yield and calorific power, and a rise in the sulphur impurity. It certainly gives an increased amount of difficult matter to deal with in the pipe, and there is, at the same time, no relief in case of blockage. On the other hand, there is no certainty that with two pipes both shall be at, or available for, work; and there also remains the fact that double the number of pipes have to be augered and cleared. The author's own opinion would be guided by the question of heats and charges, and such other circumstances as affect the "pipe trouble" question. Provided the pipes are likely to be reasonably free, one pipe would be preferable; but were trouble imminent—

such as light charges burnt off in (say) six hours at high heats—then by all means instal two.

Temperature of the Pipe.

The next considerations are in regard to the external surrounding temperature of the pipe itself. The radiation and consequent condensation are, to a great extent, regulated thereby. In a well-ventilated house, with an absence of cutting draughts, a condition of affairs exists which results in a uniform low temperature of the pipe. Copious condensation ensues; but provided the pipe is sufficiently large, and other conditions are favourable, the pipe will clear itself during the hour when the gas flow is small. On the other hand, in a small house or one protected from wind, the reverse may take place, and conditions resulting in a uniformly hot pipe be present. Condensation is thereby greatly reduced, and the advantages from the point of view of stopped pipes are often so great that the function has in some works been artificially aided by jacketing the pipes with non-conducting material.

The various conditions tending to produce cutting draughts around the pipes may cause the pipes to be cool locally, either throughout the house or in individual cases. This usually results in excessive condensation at and around the cool part, which may occur in sufficient quantity as to block-up the passage. The reverse condition of local heat is usually caused in the lower regions of the pipe by the near presence of other mouthpieces, buckstays, or adjoining pipes. The condensation running down the pipe is arrested at the hot zone and redistilled, so that an accumulation of pitch results, and forms a stoppage.

It is obvious, therefore, that external as well as internal conditions are at work; and the author believes that the differences experienced in similar houses, working on the same system, but differently placed regarding the prevailing winds and ground draughts, are often due to this cause.

Excessive Vacuum or Pressure.

Of the influences met with in ordinary carbonizing working which are felt in connection with the ascension-pipe, the vacuum or pressure is one of the most important. An excess of vacuum helps to clear the pipe quickly of the gas entering, but with the average retort draws in a good deal of hot furnace gas, and so hardens any condensed products on the pipe-walls. With holes, the effect is still more noticeable, and a complete blocking of the bridge with fine soot in addition, is often the result.

Excessive pressure on the retort causes an excess of tar to be deposited, and is noticed as a stoppage at the time, or else shows later with a rise of the gas temperature, as a hard scale deposit consequent upon the distilling of the excess condensation.

Damp Coals, Steam, and Water.

The question of damp coals is to some extent undecided in its advantage; but the author thinks that as a preventative for pipe troubles their efficiency is undoubted. This would seem to be due to two causes—the more even rate of gas production, and the evolved steam lowering the average temperature of the gases. When a proportion of such a charge of coals is on the mouthpiece, a small but steady flow of gas continuing throughout the period keeps the pipe moist, and so prevents the pitch from becoming viscous. The loss in make per ton may be as high as 200 cubic feet; but in certain circumstances it is worth it in the resulting freedom from pipe troubles.

As an artificial furtherance of the action, the practice has been adopted of blowing a proportion of steam up the pipe. This has been found successful, where properly and intelligently applied. The author's own observations lead him to the conclusion that it should not be turned on except during the first quarter of the distilling period. During this time, it lowers the temperature of the gases, and in doing so is beneficial. After this, however, the reverse takes place, and the pitch being rendered more viscous during the period available for it to run down into the mouthpiece the object of the steam is defeated.

A practice which has found a certain amount of favour may also be here referred to. It consists in dropping water into the arch-pipe through a goose-neck. In cases where the coals are dusty, it may be of value; but otherwise there would seem to be little more than "faith" in it.

Design of the Ascension-Pipe.

As a conclusion to this study of the ascension-pipe and its action, it will not be out of place to consider the form and design of the pipe, the bridge, and the dip.

It would seem, from some existing examples, that little attention has been given to the subject. It is not enough to design the setting, and then make numerous fantastic castings to fit round other mouthpieces, to carry away the gas, without regard to facilities for cleaning, for the running down of condensates, or for the prevention of local heating. As far as possible, the pipe should be straight—bends to be easy, and all in one direction—and there ought to be plenty of room for air circulation around the pipes. The joint should be quite flush inside, whether it be of the flange or socket type (preferably the latter). And, lastly, it ought to be possible to take down any pipe without disturbing the others or having to remove any of the mouthpieces.

The Arch-Pipe and Dip-Pipe.

In spite of the many and varied forms of arch-pipe extant, the greater proportion fall short of the ideal to a varied extent. The author thinks they should conform to the following *desiderata:* Light, easily handled, provision for a straight drop from cap downwards, prevention of deposit being discharged into dip while cleaning, cap or caps easily removable, preferably a machine-turned plug, and easily cleaned while standing on the hydraulic main without danger of falling over. The curve at the top is also best as an easy bend, so as not to cause mechanical deposition by a sudden reversal of the flow.

The dip-pipe should be easily removed from the main, should have a turned knife-edge bottom, and provision should be made for setting level in the main without resorting to uneven and thick joints.

Dimensions.

There would seem to be considerable differences in current opinion respecting the dimensions of these fittings. As far as possible, the length of the pipe should be kept short, providing sufficient clearance to minimize pitching-up is maintained between the hydraulic and the top of the beds. The condensation in a long pipe is often a difficulty, as the pipe is unable to clear itself even though favourable conditions are present.

With regard to diameter, the author would suggest the following sizes as, in his experience, capable of giving good results:—

Size of Retort.	Diam. with One Pipe.	Diam. with Two Pipes.
20 in. by 14 in.	6 inches	5 inches
22 ,, 16 ,,	7 ,,	6 ,,
24 ,, 18 ,,	8 ,,	7 ,,

Systems of Cleaning.

However favourable circumstances may be, some amount of pipe trouble must be expected to follow in the train of inefficient cleaning of the apparatus; and where such trouble is a necessary complement of the system worked, it becomes imperative that this question be given paramount attention. Human nature being what it is, some incentive to maintain clear pipes ought to be arranged for each shift, otherwise there is a tendency to make a hole through the deposit sufficient to keep the pipe free till the next shift is due on, when the same performance is repeated. And why not? If nobody gets credit, then there will always be a shuffling of blame. This is especially noticed where the practice of dealing "Micawber-like" with each pipe as it stops up is adopted.

A Suggestion.

The author has devised a system which will be found to work well, and with a minimum of attention, and is, so far as he is concerned, original. All pipes are tried at each time of charging (on eight hours' work, three times per day), about the fifth hour, when they are soft. The total pipes in the house are divided equally among the three shifts, and each shift is responsible for the cleanliness of its own pipes. If a pipe blocks, the procedure is as follows: Should it belong to the shift then on, it is thoroughly burnt out and cleaned. If not, it is cleared with a long auger from the bottom, or, if necessary, a hole made high up from the top. A record is kept, and passed on to the shift foreman responsible for the pipe, who at the commencement of his shift thoroughly burns it out and cleans it.

By this means, the pipes are always kept going, and entirely burnt out the same day they block. It is to the shift's interest to maintain them clear, and, of course, the number of uncleared pipes is obvious to those in charge. Further, the record of cleaned and cleared pipes forms an efficient check upon the working of the house.

Financial.

To enter into the financial aspects of stopped pipes would be out of place here. It would seem to the author to be a delicate question, and the balancing of loss of gas, the temporary loss of retorts, and the charge for labour, against the advantage of systems causing these troubles, must be left on this occasion.

Conclusion.

The action of the ascension-pipe, the cause and effect of its function, the cause and effect of circumstances leading to difficulties, and the lines to be followed to eliminate these troubles, having been studied, it will be of use to sum up the deductions. It will be obvious that, under certain circumstances, the stopped pipe is a *sine qua non;* that under other circumstances it is not at all likely; and that under all circumstances much may be done to minimize the trouble and loss of money involved. But in any individual case the whole of the conditions present must be weighed against the question "Does it pay?"—the Alpha and Omega of engineering.

Finally, in apologizing for the brevity of some of this explanation, the author would point out that this has been done to minimize complication, and that the inferences omitted are either obvious or minor details. He trusts his remarks have excited interest.

DISCUSSION.

The President (Mr. D. J. Winslow, Lea Bridge) remarked that they had had a very interesting paper, and he hoped there would be a good discussion.

Mr. Lacey, Jun. (Nine Elms), said the causes of stopped pipes seemed to be divided under three headings. It appeared to him that the author laid rather too much stress on the effect of pressure on the ascension-pipe. He said: "Should the seal be heavy or the vacuum be short, or, again, accumulations of thick tar occur beneath the dip—in any of which cases it is necessary that

a pressure occur in the pipe before the gas can be released." The question was, How much was this pressure going to increase? The conditions did not alter very materially. That was to say, any changes that occurred would not materially affect the rate at which gas was produced, or anything of the kind. The author continued: "The period during which the condensation can take place is prolonged." He did not know why this should be. It was, of course, quite possible that the effect of pressure was that, instead of going up the ascension-pipe, a great proportion of the gas went into the settings. They must remember that once a pipe was stopped, excessive pressure would aggravate the case; and if they got a stopped pipe, pressure followed. But they must not say that pressure *per se* was necessarily going to cause a stopped pipe. With regard to the question of damp coals, Mr. Stewart made some interesting remarks. He (the speaker) had with him some particulars of experiments carried out at the Nine Elms works earlier this year, with the object of ascertaining the effect of damp coals on the temperature of the ascension-pipe; and in view of the paper, they might perhaps be considered worth mentioning. The investigation was carried out in a small experimental retort, 8 feet long, of ⌂ shape; and about 145 lbs. of Londonderry coal was used. In the first case, the coal was taken as it came from the barge, and not artificially dried. It was put in the retort, and the temperature of the ascension-pipe was read every six minutes. The half-hourly make of gas was taken, and some other figures in connection with the gas were also recorded. In the case of the dry coal, the temperature at the top of the ascension-pipe started at 206° Fahr. This went up, at rather less than the end of the first hour, to 277°, and then fell off fairly steadily towards the end, until it finally finished up at 106°. An interesting point was the rate at which the gas was given off. The number of cubic feet in the first half hour was 114, and in the second half hour 109; while in the last two half hours the figures were respectively 51 and 20. The make of gas per ton was 12,251 cubic feet; the illuminating power 14·92 candles; the gross calorific value 147 calories; and the net 131 calories. For the analysis of wet coal, the coal was taken from the barge, broken up fairly small, placed on a concrete floor, and mixed with as much water as it would hold—that was, about 10 per cent. It was then put in the retort and carbonized for the same period as in the case of the dry coal. The temperature at the top of the ascension-pipe started at 448° Fahr.—that was to say, at the end of the first six minutes. It went up in the next six minutes to 455°, and then fell steadily to the end of the charge, when it was 178°, which, of course, was much greater than the temperature finished at in the other case. The rate at which gas was produced was again interesting. The number of cubic feet in the first half hour was 89, and in the second half hour 97; and then it went up and down slightly, finishing in the last half hour with 85 feet. This bore out what the author had said as to regularity. Contrary, however, to his experience, the make of gas per ton went up to 12,500 cubic feet. But, of course, it was impossible to dogmatize from one experiment like this, because they could not say the temperature of the setting was the same in both cases. The illuminating power and the calorific value both suffered very badly as the result of the water. The illuminating power was 13·52 candles, instead of 14·92; while the gross and net calorific value fell from 147 and 131 calories respectively to 139 and 123 calories. The CO_2 went up from 2·1 per cent. to 3·5 per cent.; and the hydrocarbons fell from 3·2 per cent. to 2·6 per cent. This seemed to show that the gas engineer would be well advised to think before he actually added water to the coal, unless, of course, stopped pipes were very bad, and he therefore regarded such an experiment as being justified.

Mr. A. F. Browne (Vauxhall) remarked that the paper was a valuable one, which must have cost the author a great deal of time and trouble to produce; and he was glad they had invited him to the meeting to hear it read. In discussing the matters dealt with, he felt it would be useful to the members if he were to relate to them some experience on a very large scale, illustrating the effect of mass carbonization as contrasted with layer carbonization upon the trouble of stopped pipes, which every works manager had suffered from more or less since he knew anything about the retort-house. It was now several years since the South Metropolitan Gas Company adopted the principle of mass carbonization, in horizontal retorts, with twelve-hour large charges of 11 to 11½ cwt. in a retort 20 feet by 21 inches by 15 inches. This step was immediately followed by a very marked change as regarded the stopped pipe trouble. Indeed, so much was this the case that he might mention that at Vauxhall they had been previously employing for some years an excellent mechanical pipe-auger, which was produced at the works of Sir William Arrol and Co., and, he believed, was first tried at Beckton. When in course of time it came to Vauxhall, and they had strengthened some of the weaker parts of the construction, it did admirable service; and when they arrived at the point of finally parting with it, because there were no more stopped pipes, he was able to say it was the most effective piece of apparatus in the retort-house he had ever met with. To-day it was lying in a shed at the Kennington gasholder station, because there was practically no work for it to do. He was not going to say that stopped pipes were absolutely unknown on the works; but to illustrate further the radical change which had followed upon the adoption of the mass charge, he would add that another great nuisance became a thing of the past, and that was the pitching-up of the hydraulic main. This quite disappeared with the stopped pipes; and to-day, when they had higher heats than they had ever worked before, or at any rate as high, the tar in the hydraulic main was quite fluid, and would run like water. A third change for the better which supervened upon the adoption of mass charges was that the amount of free carbon in the tar, which had been a great nuisance in times gone by, fell enormously—in fact, it was reduced to a minimum. A fourth direct advantage resulting from the change also concerned the tar. A few years ago they heard a great deal about the nuisance of water in tar, and the means to be adopted to get rid of it. Well, this also fell to a minimum—a fact which was directly traceable apparently to the reduction of the finely-divided carbon, which in some way kept the water in suspension in the tar. Other great advantages followed the adoption of mass charges. The South Metropolitan Company were committed to this system, and their works were supplied with the mechanical stoking plant best suited to this end. The executive was convinced that by the adoption of the mass charge they obtained the greatest value from the coal which they put into the retorts. When he told them that last year upwards of 1,000,000 tons of coal were carbonized in this way, they would see that this conviction was based upon the results of an experiment on a really enormous scale. He understood Mr. Stewart to say—and it was a statement of which he might well be proud, though he did not know that he was—that he had investigated this question of stopped ascension-pipes, and it had proved to be to him a problem of fascinating interest. This was what constituted the value of the paper. The author set about finding out for himself the extraordinary difficulties of the subject, and tracing them to their source; and having done this, he presented the Association with the results of his labours. What was required at meetings of this kind was that a man should come and give his own personal experiences, and subject his conclusions to the criticisms of his fellows. It was the best thing a member could do for an Association of this kind. He fancied he gathered from internal evidence in the paper that the greater number of these experiments—which he understood had been put in hand somewhat recently—were made upon charges which would be better described as being layer than as mass charges. Was this so? He was a little surprised to find the statement made by the author in the paper as to the comparative temperatures of the gas leaving the retort in the layer and mass systems. He said that, whereas in the case of the layer system the temperature was as high as 600° to 800° Fahr., in the mass system it was not more than from 300° to 450° Fahr. Perhaps he (Mr. Browne) might give them the results of a test which he had made on one of his twelve-hour mass charges. He found the temperature in the ascension-pipes, 4 feet from the mouthpiece, three-quarters of an hour after charging, was 273° Fahr. At the end of three hours, it had risen to 620°; at the end of four hours, it was 600°; at the end of eight hours, 496°; and at the end of eleven hours, when practically all the gas was out, it was 464°. He did not know that a trial of this kind was worth much, compared with the work put into the paper; but still he had no reason to think these temperatures were excessive. Coming to the portion of the paper dealing with the temperature of the pipe, Mr. Stewart seemed to make an admission. He had been urging the desirability of keeping the ascension-pipe cool, and more especially that there should not be zones in it, but a gradual reduction of temperature from mouth of the pipe to bridge. In these special local conditions, he made a concession to an opposite view and theory when he said: "On the other hand, in a small house, or one protected from wind, the reverse may take place, and conditions resulting in a uniformly hot pipe be present. Condensation is thereby greatly reduced, and the advantages from the point of view of stopped pipes are often so great that the function has in some works been artificially aided by jacketing the pipes with non-conducting material." Now, it might be that the higher temperatures which he (the speaker) had just mentioned were an instance of the desirability of having the pipe at rather higher than lower temperatures. He presumed it depended largely upon whether the charge was mass or layer. He thought Mr. Stewart had proved his point as to the possibility and probability of the condensation and the re-volatilization of the condensates trickling down the ascension-pipe. This was good, and well worked out. He did not wish to say that such a thing as a stopped pipe was unknown at Vauxhall, or that even such an impediment as a pitch-plug was altogether unknown. But if he told them that nothing like 1 per cent. of stopped pipes was experienced, it would be admitted that they were very free from the trouble. He came now to another point upon which Mr. Stewart had laid stress—namely, the influence of the leaky retort. He (Mr. Browne) was not in any way a believer in the leaky retort; and he would tell them why. The gas-retort, like the human body, did its own repairs while at work; and it was quite astonishing to find the extent to which a retort did repair itself and make itself sound. If, after having scurfed a retort, they threw a couple of shovelfuls of coal into it, and shut it up for an hour or so, in all probability they would see some black smoke coming up the chimney. It would cease almost immediately; and if at the end of the period they opened the retort, they would see a lot of fluffy carbon on the surface. This was directly due to the dissociation of the gases and the throwing out of free carbon. They could understand very well that if there were holes or cracks in the retort, gas would go through them; and if they were of any considerable size, it would be shown on the output of the chimney. Black smoke would pass out perhaps throughout the charge. If there was excessive vacuum, it was very probable

that something would pass in from the outside. But as illustrating this point, he would tell them of an experience. During the past winter, they reconstructed a retort-house at Vauxhall, which was got ready for work just in time for the peak of the load. When it was put into operation, one would have expected (if there was much in this idea of leakage into and out of the retort), with a large number of perfectly new retorts put to work, that the make would have gone up very considerably, as compared with what it had been before. He was, however, unable to trace this in the daily records. The makes per ton remained practically as before. Later on, in January, they threw out a retort-house which was certainly on its last legs—there had been some leakage from the retorts. They had wanted patching day by day and they had watched them very carefully. Even he anticipated that, when they had got rid of this house, the make was going to be considerably better per retort and per ton. He had been disappointed in a sense in the case of the new retorts; but with the old retorts put out of action, he did really expect an increase in the make per ton, and possibly an improvement in the composition of the gas. There was, however, little or no difference; and this confirmed him in the opinion which he had held for many years, that, given reasonable care and supervision, retorts would keep themselves tight. Therefore he did not think there was much in Mr. Stewart's theory that pipes were often stopped—he did not say they could not be—owing to the pulling of furnace gases through holes, though what came in would be admittedly at a very high temperature. In this connection, he would like to ask the author what was the source of the fine soot that blocked up the bridge-pipe. They got no soot from furnace gases, burnt or unburnt. The statement with reference to damp coals was a valuable one; and the experiment was of great interest to him personally. Of course, they often got wet or damp coals; but in the case just spoken of, the moisture was carried to its absolute point of saturation. The coal would not take up any more; and it was exceedingly interesting to find that, in this experiment at all events, the gas did not decrease in volume. There did not seem to be any reason why it should, though, of course, he could see that, when carbonizing wet coal, more fuel might be required. Mr. Stewart, however, had said there was a loss in the make of gas per ton which might be as much as 200 cubic feet. How did he arrive at this figure? Again, in connection with keeping the ascension-pipes moist, Mr. Stewart appeared to admit a small loss of tar. At Vauxhall, they were very careful as regards this point, and were taking the greatest trouble to ensure that the coal should be carbonized right up to the iron mouthpiece. If the day's work was to pass muster, when the retort was opened the end of the charge must be a bright glowing mass, and there might be on the iron mouthpiece only what might be called carbonized pitchy tar, and as little of that as possible. This was a very important point. He did not believe that it was possible to work off an eight hour charge large enough to be described as a mass charge having a really well carbonized and bright mouthpiece end. Even Mr. Stewart, with all his care, attention, and knowledge of the retort-house, could not get over the difficulties of the vacant space in the retort. If they had a free space with high-temperature carbonization, there must be dissociation of the gases; and the only way to avoid the free carbon—and, as he believed, to cure stopped pipes, and practically do away with them—was to prevent dissociation of the gases in a free space in the retort. It was to this, more than to anything else, that he attributed their immunity at Vauxhall from stopped pipes.

Mr. W. A. Vanner (Walton-on-Thames) expressed surprise that no one had referred to the question of hydraulic mains *v.* dry seals. If the author had had any experience with dry seals, he would like to know whether he had made any experiments on the ascension-pipe in that case. There seemed no doubt that it was best to have an even vacuum in the retort-house; and he thought the only way to secure it was to put in an efficient retort-house governor. Again, had Mr. Stewart made any experiments with regard to pressure in the retort? He (the speaker) had had some experience with pitched-up mains, and found on one occasion the pressure in the retort was actually 6 inches. He did not know whether anyone at any time had made experiments on a large setting with 2-inch ascension-pipes, instead of 5, 6, 7, or 8 inch ones; the idea being that the pressure from the retort would be sufficient to keep these 2-inch pipes clear. Whether the theory was correct, he could not say; but the trouble would be, if the pipes did get pitched-up, to clear them.

Mr. D. C. Cross (Lea Bridge) said they had tried, on a setting of inclined retorts, putting 2-inch ascension-pipes on the top mouthpieces, to see if they would help; and practically every pipe got stopped in four hours, with eight-hour charges. These 2-inch pipes were merely auxiliary ones. They had never worked them independently of the larger ascension-pipes.

The President said he would have liked Mr. Stewart to carry his experiments a little further, and give them some more remedies. He finished up by saying that, of course, the question was, "Does it pay?" He took this remark to apply particularly to the paragraph in which the author spoke of making somebody responsible for seeing that the pipes were properly augered. Of course, if a man did not get any credit, he was not going to take more trouble than he could help—unless co-partnership came to their assistance in this matter as in others. He was rather surprised at the remarks made in the paper with reference to allowing water to run down ascension-pipes—that it was more a matter of faith than anything else. He himself had in mind a case where water was allowed to run down the pipes. Unfortunately, the pipes soon got stopped up; but it gave considerable relief at the time. He would therefore like to suggest that there was a little more than faith in the idea, and that if they could ensure the water reaching the bottom of the ascension-pipes it was of some use to them. The remarks about the use of two pipes were apt. It was always quite a moot point, he thought, whether they were in use together. He wished to thank Mr. Browne for addressing them.

Mr. Stewart, in the course of his reply to the discussion, said Mr. Lacey's experiments were very interesting, and seemed to have confirmed to a great extent what he had said in his paper. The fact of the temperature being higher in the case of the damp coals he attributed to steam being produced in large quantities. He could not agree with Mr. Lacey in what he said about pressure. If they had a light seal, there was a steady flow of gas; but if there was a block at one end due to the seal, gas was continually being made in the retort, and the gas in the ascension-pipe remained there for a time, whereas in the other case it was not in the pipe more than a second. In this way, he believed more condensation resulted. It was easy to prove, with a gauge, that the pressure did actually occur. He had to thank Mr. Browne for his helpful and corroborative remarks. Mr. Browne suggested that many of the investigations referred to in the paper had been carried out with what might be called layer carbonization. If he had had Mr. Browne's experience with mass carbonization, there would not have been anything for him to talk about in his paper. It was easy to understand that in the circumstances set forth Mr. Browne's tar was very fluid, because it had not had all the lighter oils taken out of it in the free space. From Mr. Browne's remarks, he had learned something about water in the tar being related in some way to the free carbon. It had never occurred to him before; but he could quite believe it was possible. Mr. Browne said the temperature of the front edge of his charge was as high as the middle; and probably this was the cause of his ascension-pipe temperatures being slightly higher than those given in the paper for mass charges. In his paper he said with damp coals on the mouthpiece there was a loss in make. He was not referring to the use of such coals in the retort. It was apparent that if they had dry coal on the mouthpiece, the temperature of the retort would carbonize it directly; but if it was wet, the carbonizing was delayed, and the little piece of coal in front was not burnt off. This would account for the drop of 200 cubic feet per ton. He had arrived at the figure when they were making experiments in heavy charging with a Fiddes-Aldridge machine.

Mr. Browne: Mr. Lacey shows an actual increase in volume from wet coals.

Mr. Stewart said it was not the same quality gas. It was 13·52 candles, instead of 14·92. If he had had to reduce his vacuum to bring up the illuminating power, perhaps his make might have been less. As to leaky retorts, he believed a retort could scurf itself up and be fairly tight; but, at the same time, they did get holes which would never scurf up, and hot gases came through. When he wrote the word "soot," he meant that when the high-temperature flue gases got into the ordinary gas, they dissociated it. This seemed a perfectly feasible theory. He believed they dissociated the hydrocarbons and caused soot. He had always noticed that a retort with a bad hole in it gave trouble with the pipe; and it was invariably this fine, sooty matter. In talking of the causes of stopped pipes, it seemed he had given the impression that he laid too much stress on one point and not enough on another. Because he had mentioned a thing in detail as causing stopped pipes, he did not want it to go out that he necessarily meant it was a primary cause. It might be a secondary cause, but still it had to be reckoned with. It was not possible to classify them, as a primary cause in one case might in another be a secondary one, and *vice versâ*. In answer to Mr. Vanner, he had never had any working experience with a dry seal. He had worked wet mains unsealed, and had always found they could work as well with an unsealed house if they kept the vacuum steady. But the slightest alteration in the vacuum affected the quality to such an extent that the subsequent variations in the pull to put matters right, as a rule, induced pipe troubles. Of course, a retort-house governor did help considerably in keeping an even vacuum, and provided it worked satisfactorily was a help in keeping down pipe troubles. He had said that a light seal was a help to stopped pipes; but he did not know that it was a help to anything else, such as keeping even quality. As to 2-inch pipes, if they considered the amount of surface in proportion to the area as compared with an 8-inch pipe, they would agree that the former was a far more efficient cooler of gas than the latter, and a far more inefficient carrier away of condensation products by reason of size. Therefore it was likely that it would plug-up very quickly. Mr. Cross had confirmed this. The President had found dropping water down a pipe a benefit. The only thing he (Mr. Stewart) could see in it was that it would cool the gas, and in this way cause deposition of light oils, which would make the tar fluid.

The President: It was on the layer system.

Mr. Stewart: It would be, because otherwise you would not get the stopped pipes.

Mr. Browne said he wanted to find out from the author where he really did get the soot from. He thought it would need a very big hole and a lot of vacuum to have the effect of stopping up a bridge-pipe with fine dust.

The SENIOR VICE-PRESIDENT (Mr. S. A. Carpenter, of Mill Hill) proposed a hearty vote of thanks to Mr. Stewart.

Mr. CROSS, in seconding, said one of the chief reasons for soot in the ascension-pipe he had found was a small leak in the lid of the mouthpiece. With six-hour charges, they used to get a lot of soot and dry stuff in the pipe and hydraulic main; but since increasing the charges and the heat this was disappearing. The deposit was of a stickier nature as the heats were raised. Mr. Browne had gone a step farther, and had filled the retort; and the trouble had practically completely disappeared.

The vote was carried with acclamation, and

Mr. STEWART in response said he could give no one remedy for stopped pipes, because they all required different cures. They could drop their heats to blood heat, or take up mass charging or vertical retorts; otherwise they must look in each case for the cause of the trouble, as he (Mr. Stewart) had indicated, and either remove it or, if it was a necessary complement of the system worked, adopt preventative rather than curative measures. As far as the soot was concerned, he was going to look into this question further, after having heard Mr. Browne's remarks, and endeavour to obtain some conclusive results.

THE REQUIREMENTS OF STREET LIGHTING.

At a Meeting of the New England Section of the American Illuminating Engineering Society, held in Boston (Mass.) a few weeks ago, a paper dealing with the requirements of street lighting was read by Mr. C. A. B. HALVORSON, JUN. The following extracts from the paper and the report of the discussion are taken from the "Transactions" of the Society.

In planning a system of exterior illumination to meet the requirements of the city of to-day, the needs of each section of the city must be carefully considered. The shopping centres demand one type of illumination peculiarly their own; the residential streets, open parks, drives, and outlying districts all in their turn require special consideration and quite different treatment, as regards both the illuminating units and the ornamental standards or fixtures employed. Unfortunately, it is quite impossible by the use of illuminating data alone to show exactly what system of lighting should be employed in each case to accomplish the best results, as frequently certain psychological and physiological requirements play parts of vast importance.

The lighting of business streets requires, in addition to the usual purposes of good general lighting (police protection, ability to read easily and distinguish persons, &c.), an illumination tolerable and pleasing to the eye, yet sufficiently brilliant to produce a marked effect in the improvement of business—obviously a matter of great general interest to the city—by attracting people to the brilliantly lighted thoroughfares and at the same time allowing their attention to be drawn freely to the matter of most importance, which is, of course, the attractive window displays and decorations. This object is largely attained by means of the contrast between the colour schemes employed in these decorations and the colour of the general illumination. It follows, therefore, that general illumination must be furnished that differs in colour from the illumination obtained from the small lighting units usually employed in the merchant's local display, and also differing from, and not interfering with, the colour effects obtained by reflection or secondary illumination from the goods displayed. White light falling on the show window from without can only enhance the colour values by showing them correctly. Obviously, then, the colour and quality of the light play a most important part in successful lighting of this kind. Accordingly, white light of low intrinsic brilliancy must be employed in order to obtain the best results.

The intensity of the illumination, perhaps, should be considered of next importance; for the ratio of general illumination to window illumination should be such that the window illumination far outweighs the general illumination. As good window display lighting requires about 15 foot-candles, it is highly improbable that any economical scheme of general illumination that could be obtained would approach this figure. A possible exception is yellow flame arc lighting; but this, on account of the colour, would be highly unsuitable, assuming that such illuminants were placed low, as they usually are in this country, and in the direct range of vision, in which case an immense volume of light would be directed toward the show windows.

Other important considerations are the appearance of the lighted unit; the illumination of the building fronts from both æsthetic and economic view-points, the latter particularly as regards the benefits accruing to the upper-floor tenants; the daytime appearance of the lighting standard—dignified, simple, or ornate, as harmony with its surroundings requires, and yet unobtrusive and free from overhanging arms and glassware that might impede traffic and endanger pedestrians. Above all, the lighting unit must aid in beautifying the street rather than produce the effect of crowding and over-burdening which is so characteristic of many systems of so-called ornamental lighting.

The problem of laying out a "Great White Way" system as described above is quite different from that of lighting the streets of the residential section, for the latter is largely a utilitarian one, and bears on the matter of police protection and suitable lighting for pedestrians, motorists, and other users of the thoroughfare. Residential street lighting is, from its very nature, of low average intensity. As this class of lighting comprises a relatively large percentage of the city's streets, it is important, for obvious reasons, that the most efficient unit suitable be used. It is desirable, also, to employ as few light sources as possible for a given average intensity of illumination, since the apparent effect produced by many small light sources is that of a very much lower intensity of illumination, because the only images produced on the retina of the eye are those of the light sources themselves. In residential street lighting, the principle of "silhouette" lighting must be employed—that is, seeing is accomplished by the discernment of objects in contrast with a lighted background, which usually is the street surface, rather than by light reflected from the objects themselves.

In the opinion of the writer, a non-uniform illumination is more desirable for this class of lighting than one extremely uniform, assuming that the minimum intensity in each case is about equal, but the average intensity higher in the case of the arc lamps than in the case of low-candle-power units, and assuming, of course, the same expenditure of energy per lineal foot of street, and that each light source is properly screened by a diffusing globe.

The proper lighting of drives, highways, and parkways requires the use of a specially designed arc lighting unit which combines white light with maximum efficiency and a low maintenance cost, as well as a low initial cost when compared with the installation of many small units of low candle power. The requirements of such illumination are not greatly different from those of the residential streets—that is, in the employment of the silhouette principle of lighting. With such lighting the ability of the eye to see objects clearly a sufficient distance ahead to avoid collision is greater than with any other type of illumination. Obviously, it is necessary that the light sources should be mounted well above and outside the direct line of vision, and that they should be of low intrinsic brilliancy, as too intense a light source destroys the adaptability of the eye to low average intensity work.

For business streets and other thoroughfares where the requirement is the very best kind of high-intensity illumination, lamps of 520 watts at 6·6 amperes and 320 watts at 4 amperes on standards 14 ft. 6 in. high, may be used. In many cases, a satisfactory spacing for units of this type has been found to be approximately 75 to 100 feet on centres on each side of the street, with the standards in a zig-zag arrangement. For residential streets and broad boulevards where the screening effect of foliage must be considered, and for all other lighting classified as "second class," the residential lamp of 300 watts at 4 amperes, on a standard 12 feet high, can be employed to give the best results. The spacing of this lamp, like that of the one just described, varies with the local conditions, but 300 feet apart in zig-zag arrangement gives an exceedingly satisfactory illumination. For highways, open parks and drives, and all other purposes where an efficient ornamental unit is desired, and where there is but little danger of screening the light source by foliage, the parkway lamp at 300 and 500 watts and 4 and 6·6 amperes, on a standard 18 feet high, may be employed in order to utilize to the highest degree the principle of silhouette lighting.

With these three units it is believed that the complex and exacting requirements of scientific street illumination can be successfully met, from both a utilitarian and an artistic point of view.

In the course of the discussion on the paper,

Mr. P. S. MILLAR said two points were particularly worthy of note. The first was that the comparatively brilliant illumination of a thoroughfare does not detract from window displays if there is considerable contrast between the colour of the street light and that employed in the windows; and the other, the importance of the appearance which the street lighting fixtures present in the daytime, and the part they play in the general appearance of a street. Both points well merited greater consideration than had been given to them in the past. The "silhouette" effect in street lighting, which was emphasized so strongly in the paper, was of greatest importance where the requirements were for the discernment of large objects. Lighting of streets with a few large units rather than with many small ones was likely to promote this form of seeing. It must not be forgotten, however, that the requirements for the discernment of small irregularities in street surface were important, particularly to the pedestrian and the driver of a slow-moving vehicle. The illuminating effect was one of a number of considerations which determine the choice of a street lighting system. In so far as it was the leading consideration, our understanding of street lighting requirements was rather vague. Much remained to be done in the study of street illumination before the principles determining the balance between the number and size of units could be announced. Until then, practice must be guided by conclusions drawn from views of individual experts, one extreme of which appeared to be represented in the paper. It was the logical conclusion of this extreme view that, in all classes of streets, lamps of relatively large power might be employed to secure best results. There would probably be many who would join issue with the author in regard to this conclusion. It was to be hoped that the study of this question might be undertaken seriously, with the view of answering some of the moot questions suggested by the paper.

Mr. W. A. DARRAH, while acknowledging that, from the standpoint of the effect produced, the illumination of city streets was a matter which could not be fully expressed in scientific formulæ because of the psychological element involved, considered there

were certain points which were capable of rather exact determination. Whether the lighting of residential sections was considered, or whether the illumination was confined entirely to that of business districts, it was his opinion that the light source should be placed well above the range of vision in all ordinary cases—from 25 to 35 feet being a desirable height.

Mr. J. R. CRAVATH expressed the opinion that the position taken by the author, that it was desirable to employ as few light sources as possible for a given average intensity of illumination on residential streets was obviously subject to very considerable limitation, because if it were carried to its logical conclusion there would be but one source of light for an entire length of street. The author's opinion that non-uniform illumination was more desirable than illumination which was extremely uniform for this class of lighting was open to considerable question. Within the past few years, much intelligent effort had been directed towards producing more uniform illumination along a street, on the theory that the extreme contrast between the areas of high and low illumination is detrimental to seeing clearly, as is also the blinding effect of lamps of high candle power spaced at infrequent intervals; and there was no doubt whatever that changes in the direction of better uniformity had resulted in decidedly improved street lighting in many residential streets.

Professor J. M. BRYANT remarked that the author had apparently made a careful study of the general conditions required for lighting in a medium-sized city. Too many cities had made the mistake of spending all their available money to appease the business men who were influential citizens paying a considerable part of the taxes. Within the last few years, however, another portion of the city—viz., the better residential portions, parks, and boulevards—had received more attention since these same influential citizens had found it a pleasure to be out in the evening in their automobiles. The poorer business and manufacturing portions of the city, as well as the poorer residential parts, had received but little consideration as to lighting. Since it was here that the greatest amount of crime existed, the aim should be to light and care for these districts in a much better manner, in order to improve the character of the inhabitants and aid in police protection. No one form of lighting unit could be employed with equal effectiveness or economy in all parts of a city. Lamps of high candle power must be used for lighting in places requiring strong light and also rather wide distribution. For park lighting and broad boulevards, the arc light might be employed to advantage, provided enclosing globes were used, thus lowering its intrinsic brilliancy. In lighting the streets in residential quarters, the unit of lower candle power obtained only in incandescent lamps should be employed; but it had been found advisable to screen even these lamps by globes, to make it easier for the eye to distinguish distant objects.

DETERIORATION AND SPONTANEOUS COMBUSTION OF GAS COAL.

A paper on this subject was read at a recent meeting of the American Society of Mechanical Engineers, by Mr. PERRY BARKER, of Boston (Mass.), and it was given, with some notes of the remarks made upon it, in the February number of the Society's "Journal." It was as follows.

In the storage of coal, the risk due to spontaneous combustion must receive serious consideration. Spontaneous combustion is caused by slow oxidation, principally of carbon compounds in an air supply which is sufficient to support the process of oxidation but not sufficient to remove entirely the heat thus produced. The majority of cement manufacturers use gas coal slack for burning, having an average analysis as follows:—

Moisture	3·00
Volatile matter	33·50
Fixed carbon	55·50
Ash	8·00
	100·00
Sulphur	1·50

While the amount or composition of the volatile constituents of coal, or of the percentage of sulphur, gives no direct indication of the liability to spontaneous combustion, fuels of this type have been known in a number of cases to heat on storage to such an extent that ignition and serious damage due to fires have resulted. The total loss of heat value due to storage without spontaneous combustion is comparatively small. However, the results of deterioration which has proceeded to the ignition-point are more serious, involving the change in the character of the coal due to loss in volatile matter, abnormal percentage of moisture contained in the fuel after quenching as a last resort, costs of moving the coal in an endeavour to arrest the spread of the fire after the coal has become heated in certain localities in the piles, and financial loss from fires directly traceable to this cause.

A number of erroneous reports have been submitted as to the extent of loss in heating value due to the deterioration of coal exposed in storage. These reports contain various figures, ranging from 10 to 50 per cent., on the loss in heating value. Some results of tests of German gas coals have been submitted which state that these fuels have sustained an average loss of 1·7 per cent. of heating value per week.

The diverse nature of the data which have been published on this subject, together with the importance of the subject, has promoted extensive experiments by the United States Bureau of Mines, the Illinois State Engineering Experiment Station, and several private interests, to determine the exact nature of the reactions involved and to study methods of prevention. The processes of deterioration from which spontaneous combustion ultimately results may be best stated as set forth below.

First, as to the escape of combustible gases when fresh surfaces of coal are exposed after removal from mine workings. Experiments on coals having the analysis described indicate that the loss of combustible gases is approximately equivalent to the volume of the coal. The heating value of these gases amounts to 0·1 to 0·2 per cent. of the calorific value of the coal. The detrimental feature of this action does not lie in the small loss in fuel value, but in the dangers incurred by the escape of inflammable gases in mines, and the oxidation which accompanies the evolution of these gases.

Next as to the absorption of oxygen from the air, with consequent evolution of heat. This reaction is conceded to be the primary factor in the process of coal deterioration and production of heat in piles, and is caused by the direct union of the oxygen of the atmosphere with unsaturated carbon compounds in the coal matter. Freshly mined coal is very susceptible to this reaction, and absorbs oxygen with great avidity at the time of the evolution of combustible gases.

The size of coal, particularly of the type used for cement manufacture, is a primary factor in promoting deterioration. Fine coal brings larger surface exposure in contact with the atmosphere, and thus accelerates the process of oxidation in the entire mass.

The presence of moisture in abnormal percentages, particularly if coal in storage is wet and dry alternately, accelerates the processes of absorption and oxidation. The extensive experiments by the Illinois State Engineering Experiment Station have shown that the activity of these reactions is increased by wetting the samples under test.

External sources of heat, even though moderate in degree, tend to promote the reactions which produce spontaneous combustion. Heat produced by external sources may originate from contact with steam-pipes, boiler walls, or floors. This heat may also be traceable to the climatic conditions.

The importance of the oxidation of sulphur compounds in the process of deterioration is a question of some contention among authorities on this subject. Though the total heat evolved from this source is not large in comparison with that produced by the several sources already noted, it will undoubtedly promote to some extent the other reactions.

A number of experiments have been conducted upon high volatile American coals, to determine the actual loss in heating value during storage, together with observations on the slacking or reduction in size produced by the deterioration. Universal opinion is now to the effect that such coals will lose from 1 to 3 per cent. of their heating value in one year. A large percentage of this loss results within from three to six months after the coal is placed in store. It is apparent that the loss in heating value is not the most serious consideration in the question of coal storage. However, the ultimate results of deterioration which has proceeded to the ignition-point, though not determinable in financial units, demand that certain precautions be taken to prevent the procedure of this action to a point where ignition will result.

The methods of prevention can best be divided into the following general headings:

(*a*) Elimination of combustible gases before storage.

(*b*) Storage in piles not more than 10 or 12 feet deep, with maximum points the same distance from the exterior of the storage.

(*c*) The removal of fine coal so far as possible, storing only the screened lump. If a mixture of lump and fine coal is stored, the various sizes should be evenly distributed to prevent the formation of air passages through segregated portions of large sizes.

(*d*) Ventilation by pipes should not be attempted; and the admission of air by infiltration through brickwork or porous foundations should be prevented.

(*e*) Exposure to weather conditions, where the coal is subject to heavy rains and subsequent drying from the sun or other sources of external heating, such as steam-pipes or heated brickwork, should be avoided

(*f*) The elimination of heating by the prevention of action through submerged storage. The effect of a large percentage of moisture introduced by submerged storage has been materially lessened in a plant in which coal is stored but partially submerged. It has been found that the exposed portion of the piles maintains a sufficiently high percentage of moisture through capillary attraction to prevent serious oxidation.

(*g*) Prevention of dangerous dust and gas explosions as well as spontaneous heating caused by the storage of powdered coal. Coal for burning clinker should be pulverized at the furnace doors, and only at the rate required for immediate use.

While the extent of the loss in heating value through deterioration of high volatile American coals may not be of serious importance, the heating effects of the reactions incidental to this

deterioration demand attention to the designing of coal storage, and to the necessary procedure in arresting deterioration which has begun through lack of proper precautions.

In the course of the discussion on the paper, Mr. E. Y. Sayer referred to a bulletin issued by the United States Government on the deterioration of gas coal, and stated that the facts set forth indicated that the depreciation taking place was very rapid at first, commencing immediately after the coal was mined. But the rapidity of deterioration was greatly reduced as time went on; and, after a year or so, it became almost a fixed quantity. If this was the case, Mr. Sayer thought that a great many companies were making a mistake by periodically, or at frequent intervals, using up their storage. It would seem that storage should be looked upon as merely a matter of insurance, and that after a sufficient amount of coal had been placed in store, it should not be used until it was absolutely necessary to draw upon it.

The author, in answering Mr. Sayer's question, stated that if a pile started to fire, the first alternative would undoubtedly be to turn the coal over, provided the combustion had not proceeded to such an extent that it was impossible to get close enough to the source of heat. He had found a number of pile fires where the coal had become incandescent; and there the only alternative was flooding. He found the method of using closely covered stores in order to prevent spontaneous combustion was a very dangerous one. A fairly large volume of carbon dioxide would be produced, with the possibility that the process of heating would proceed to such an extent that large volumes of combustible gases would also be liberated, leading to explosions. He cited a case where fire was caused by a closely covered store. A pile of 10,000 or 12,000 tons coal, of exactly the character under consideration, was placed in outside storage. Snow fell to the depth of (say) 2 or 3 inches, and, instead of leaving the coal, which was already covered with snow, open, the whole storage was covered closely with rough lumber, laid tight to the pile and down to the ground, with the result that there was no ventilation whatever. The coal was wet, and serious fires started. Another of Mr. Sayer's suggestions was that, from a commercial standpoint, storage should be looked upon merely as a matter of insurance. He said the stored coal should not be used up until it was absolutely necessary to draw on it, because the greatest deterioration takes place in the first few days after the coal is mined. Mr. Barker pointed out, however, that it was very dangerous to leave coal in store for a great length of time. The two problems of deterioration and spontaneous combustion, while interdependent, were somewhat different. The loss in heat values might proceed rapidly in freshly-mined coal, and ultimately reach a minimum; but an action might have been started to such an extent that it would proceed violently, with resulting ignition. Besides, as shown in the paper, there was depreciation in the actual gas-making value of coal when placed in store. The question of moving coal which had reached a certain temperature was of great importance. A temperature of 140° to 150° Fahr. was considered sufficient cause for taking steps to move the coal; the manager preferably digging a trench of such width and length that the source of the high temperature could be readily exposed without covering it with any fresh coal.

During the presentation of his paper, Mr. Barker referred to the subject of fires, and described a method of determining the temperature at the interior of a pile by means of a ¾-inch auger containing a maximum thermometer. The auger is screwed to sections of iron rod of slightly smaller diameter, and can be driven into the pile to a distance of about 20 feet; and it requires about twenty minutes to record a maximum temperature. In reply to a question, Mr. Barker stated that the possibility of the heat produced by frictional resistance in driving the auger into the coal affecting the amount registered by the thermometer had been fully considered; but it seemed to be a factor of little consequence, because the auger is driven at the rate of 20 feet in two or three minutes.

Application of Municipal Trading Profits.

Mr. H. B. Hooper, one of the Inspectors of the Local Government Board, has a habit of giving applicants to that body for loans in connection with electricity-supply undertakings "a piece of his mind" when he is conducting inquiries in regard to the matter. An opportunity was afforded recently, when the Coventry Corporation asked to be allowed to borrow £20,000 for electricity purposes in the face of a large amount of outstanding capital. Mr. Hooper pointed out that, of the £16,000 profit made last year by the supply of electricity, £4000 had been used to relieve the rates, instead of to repay some of the capital, which had doubled in the past six years. The city were, in fact, applying money in the way he had mentioned, and borrowing to enable them to do so. This application of profits was no relief to those inhabitants of the city who paid the rates in their rent. The 2000 users of electric current were making profits for 115,000 people. One-fifteenth of the population were contributing to the rates for the benefit of others who did not use electricity. He expressed the hope that the Corporation would seriously consider the question, and, without relieving the rates, look to the future, and avoid borrowing more money. The Electricity Department was in business; and in business there was no sentiment. He had been watching local authorities for ten years, and he thought the view was being more generally held that they could not afford to make contributions in relief of rates when they had large outstanding loans on capital account. He had noticed that where rates were relieved they were rather high, and in towns where there was no contribution to them they were remarkably low.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Use of the Steam-Roller for Reinstating Roads.

SIR,—In reference to your correspondent's inquiry. He does not say whether or not the roads referred to were previously steam-rollered. If they were, I suggest that there is nothing unreasonable in the district council asking that they should be rolled after being opened by "Rochdale's" company. It appears to me the roads should be left in at least as good condition as they were before being opened. If an asphalt surface, then they should be re-asphalted; if tar-macadamed, then they should be re-tar-macadamed, and so on. Companies should be reasonable as well as district councils.

April 26, 1913. WATER-WORKS.

The "Wandering Tinker."

SIR,—There is beauty in the apt use of the phrases and quotations that adorn our language. Then why quibble if chapter and verse are for once given amiss? Let the "Wandering Tinker" pass for the "Needy Knife-Grinder," and the author of the "Sentimental Journey" gain another laurel leaf. Sir, I have no story to tell; but I ask who, with any love for sweet and telling speech, would inflict upon his hearers the source of all we say. To point a moral or adorn a tale (*Dr. Johnson*) it may at times be good. He who was criticized needs no defence. One may hear him speak on such a prosaic subject as gas; but a phrase here and there tells of sources of knowledge in other directions. So, fie upon you "Vero!" The criticism savours too much of the "midnight oil" (*Gay*).

April 26, 1913. ANON.

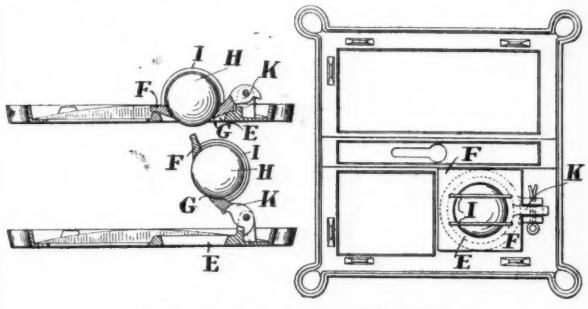
REGISTER OF PATENTS.

Trap-Doors for Street-Lamps.

PODMORE, A. E., of Herne Hill, S.E.

No. 8061; April 3, 1912.

In carrying this invention into effect, the frame for the bottom of the lantern is provided with a hole E into which the trap door F fits.



Podmore's Street-Lamp Lighting-Door.

It is somewhat in the form of the bowl of a spoon, having a circular hole G in it which is normally covered by a ball H, projecting about one quarter of its diameter through the hole in the door. The upper part of the door is provided with a guard I which encloses the ball, but with sufficient clearance to allow the latter to be freely rotated when the torch comes into contact with the ball. The door is provided with a bent shank or arm K, the free end of which is hinged in bearings limiting the arc through which it may travel, to prevent it being overbalanced and falling down on the other side, and for preventing the torch from coming into direct contact with the burner, glass, or mantle, and thereby damaging them.

Recovery of Sulphur from Mixtures Containing Tarry Matters.

HUNT, E. J., of Oldbury, and GIDDEN, W. T., of Langley.

No. 8097; April 3, 1912.

According to this invention, sulphur containing tarry matters is, while heated to a temperature sufficient to fuse the sulphur, subjected to the action of sulphuric acid, whereby the tarry matters are in part dissolved and in part converted into non-tarry substances, from which the sulphur can be recovered by the aid of a solvent or by distillation or by other means. Preferably the sulphuric acid is of a specific gravity of 140° Twaddel or over, and the temperature at which the treatment or agitation takes places will preferably not exceed 320° Fahr. The non-tarry sulphur mixture obtained may be treated with a solvent for the recovery of the sulphur either before or after separation from the acid; and the acid, when so contaminated with tarry matters as to be unfit for use, may to a great extent be purified by dilution (which separates the tarry matters) followed by filtration.

Of the mixtures containing free sulphur and tarry matters, one of the most important is spent oxide used in the purification of gas. This may first be treated with a sulphur solvent, and the crude sulphur thus obtained treated as described above; or the spent oxide may be treated directly, preferably after removal of a large portion of the

moisture. In this case the sulphuric acid will also dissolve the metallic oxides and other inorganic matter; but these are preferably removed by a preliminary treatment with some suitable acid, such as dilute sulphuric acid or hydrochloric acid.

Manufacture of Oxides of Iron for Gas Purification.

WEYMAN, G., of Newcastle-on-Tyne, and HARDIE, T., of Gateshead-on-Tyne.

No. 10,793; May 7, 1912.

This invention relates to the production from scrap iron of a material consisting principally of oxides, hydroxides, sulphides and other compounds of iron for use in gas purification, while at the same time sulphate of ammonia is produced.

The patentees mention that it is already well known how to make oxides and salts of iron and sulphate of ammonia from sulphate of iron, by the use of the ammoniacal liquor of gas-works. Many processes have, they say, been suggested for this purpose. In some of these, the sulphate of iron and the ammonia liquor were simply mixed in a vat, the liquor being drawn off, and the sulphate of ammonia allowed to crystallize out, while the iron precipitated was dried and heated to drive off sulphur, carbonic acid, and so forth, in order to leave the iron as much as possible in the condition of oxide. The sulphate of ammonia so obtained was impure, as the whole of the iron was not precipitated; and in order to precipitate the iron completely, it has been suggested to blow air through the mixture of iron pickling liquor and gas liquor, or to use ammonia gas mixed with air, obtained by blowing heated air through ammoniacal liquor.

According to the present invention the iron is completely precipitated and a "very active product for gas purification purposes is produced" by the use of sulphuretted hydrogen, which may be obtained (for instance) from a sulphate of ammonia plant. The precipitate so obtained is dried to convert it into oxide as described in the following account of how the invention is carried into effect.

Iron—that is, iron in the metallic condition, more or less mixed with other substances, including iron compounds—is treated in a vessel with a mixture of (say) sulphuric acid and water. The mixture of acid and water is made in the tank containing the iron, so that the heat developed by the mixing accelerates the reaction between iron and acid. The hydrogen produced is taken off by an outlet pipe and used as desired. When the acid is nearly or completely neutralized by the iron, the contents of the vessel, except undissolved iron, are run off into a second vessel; and steam may be used to dissolve any crystals which separate out.

The solution of ferrous sulphate from the reaction, and the accompanying substances, are then treated with ammoniacal gas liquor, or, to keep the bulk of liquid smaller, the gases evolved by heating ammoniacal gas liquor. The result is to precipitate the greater part of the iron as ferrous carbonate, hydroxide, sulphide, cyanide, and other compounds, with the formation of a solution of ammonium sulphate. The precipitation of the iron by the ammoniacal liquor is not complete; and unless the iron so left in solution is removed, the ammonium sulphate obtained will be discoloured. Hence, after the first precipitate of ferrous compounds has been removed from the liquid by filtration, decantation, or by similar means, the liquid is treated with waste gases containing sulphuretted hydrogen—such as those from sulphate of ammonia plants—whereby any iron remaining in solution is precipitated. This precipitate is removed from the liquid by filtration or decantation and added to the first precipitate. The liquid is then treated for the recovery of the ammonium salt of the acid used, by mixing it with the mother liquors of a sulphate of ammonia plant and working up the combined liquor in the usual way.

The whole of the iron may be precipitated without an intermediate filtration or decantation being required. If this is done, more sulphide will be formed than is otherwise the case, as the sulphuretted hydrogen will act on the hydroxides formed by the ammoniacal liquor or gas. As the precipitate produced by the ammoniacal liquor consists largely of carbonate, the formation of more sulphide is not as important as it otherwise would be, and is moreover remedied by the partial oxidation of the precipitate at a later stage (as is described further on). Also in case the waste gases containing sulphuretted hydrogen are those produced in sulphate plants, the carbon dioxide present in the gases will limit the amount of sulphide produced. The carbon dioxide decomposes part of the sulphide formed, with production of carbonate and some hydroxide. In this way complete precipitation of the iron is ensured without necessarily converting all the iron into sulphide, though an excess of hydrogen sulphide must be present to precipitate the iron completely.

The precipitated mass consists of sulphides, oxides, hydroxides, ferrocyanides, other compounds of iron and accompanying substances, and is dried and oxidized by atmospheric or other means and is then ready for use.

The material so produced consists mainly of ferric oxides and hydroxides, some ferrous compounds, other ferric salts, free sulphur, and accompanying substances. The material when used for gas purification purposes has, it is said, all the well-known advantages of artificially prepared hydroxides over the natural bog ore, and has moreover the advantage that, as a certain amount of sulphides of iron have been formed and these sulphides then oxidized back to oxide or hydroxide, it has the very active properties that once fouled oxide is known to possess. The presence of a small amount of ferrous iron is an advantage, as it tends to a more complete removal of the hydrocyanic acid, and moreover the ferrous hydroxide is a more rapid agent for the removal of sulphuretted hydrogen than is ferric hydroxide.

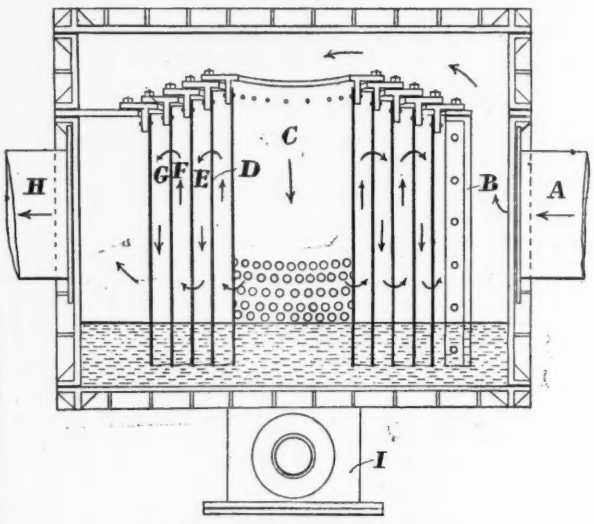
Treating Gas either in a Heated or Cooled State for Purification.

CHANDLER, S., of Balham, S.W., and WALLER, B. B., of Stroud.

No. 12,007; May 21, 1912.

This invention relates to apparatus for removing tar and other impurities from gas by causing the gas to pass through perforated partitions the size of which get smaller and smaller as the exit for the gas approaches.

According to one arrangement the apparatus causes the heavy tar from the hot gas to be thrown down immediately it leaves the hydraulic or foul main, and by the special construction of the apparatus the light oils carry the naphthalene vapours forward as far as possible at this stage of purification. To effect this, an outer vessel of any convenient shape having a gas inlet and outlet is fixed in or near the retort-house; and into this outer vessel any number of stationery perforated screens, partitions, or heavy tar separators are provided, made in sections and forming compartments so that the gases and vapours travel in a zig-zag course through it any number of times up and down. The screens are soundly joined at the upper ends; the gas passing first through perforations and then striking against a plain plate before passing to the next bay. The gas then descends through this space, and enters through another set of perforations and again strikes against a plain plate, and rises through another space and goes through another set of perforations, and so on, finally leaving at the outlet and going on towards the condensers and washer-scrubbers as usual.



Chandler and Waller's Tar Extractor.

The sectional elevation given of the vessel shows a number of thin concentric cylindrical screens or plates perforated some at their upper and some at their lower ends with holes varying in size, so as to extract gradually the tar at each stage as the gas is dealt with in the machine. The gas passes through the larger perforations first and deposits the thick tar, passing throughout the machine through perforations which diminish in size in each bay as the tar becomes less thick and its specific gravity is reduced. The vessel is divided into two chambers, and space is left above the partitions or screens for the entry of the gas which passes into the top of the central concentric cylindrical partition or screen. The gas is prevented from passing back to the inlet by a vertical plate occupying the width of the vessel and parallel with the inlet side—thus forming the gas-way.

The action of the apparatus is as follows: Gas enters at A and passes up through a space formed by the vertical division plate B to the centre of the first cylindrical plate C, and, passing through perforations, strikes against and passes through the screen or plate D—this tortuous course continuing until the gas reaches the last cylindrical screen partition or plate by way of plates C F G, and passes thence to outlet H. I shows a receptacle for receiving the heavy tar, which descends into it by gravity, and when sufficient has accumulated it is drawn off as usual.

When the gas treated is one depositing a thin tar, it is necessary, the patentees point out, to have a greater number of holes submerged than is necessary when the gas treated is one depositing a thick tar, and therefore a deeper tar seal. Hence practically the apparatus becomes a tar extractor; and after going through this process the gas may go on to the usual condensers for further reduction in temperature.

Rotary Gas Compressors.

ELLIOTT, R. P., and WALLER, B. B., of Stroud, Glos.

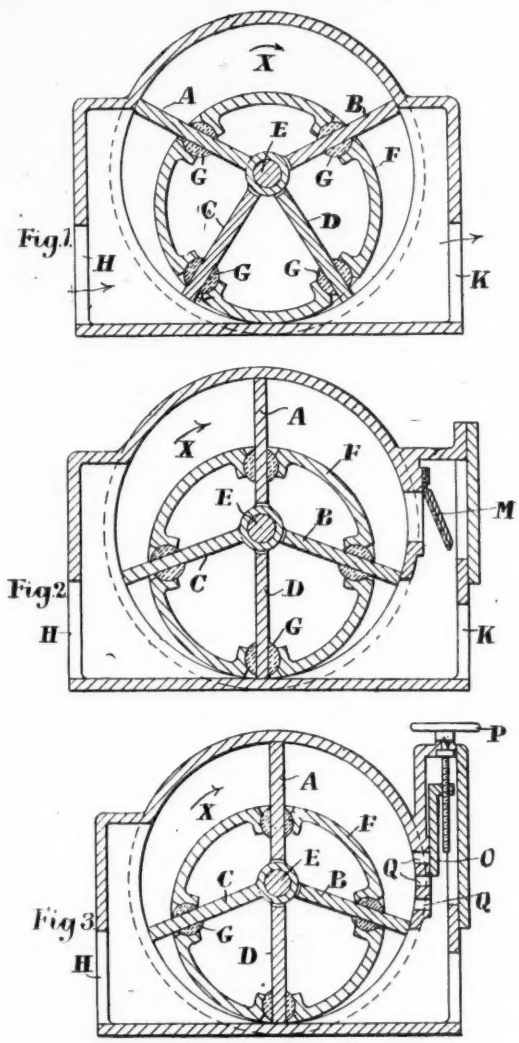
No. 18,887; Aug. 17, 1912.

This invention relates to rotary gas compressors having a number of blades, and in which the blades (loosely mounted on a central shaft) are actuated by an internally rotating drum arranged eccentrically to the blade shaft; the essential feature of the invention being to compress the gas to the discharge pressure before it is put in communication with that which has been already forced into the delivery main.

The patentees in their specification show six forms of construction. They (speaking in general) consist of a closed cylindrical casing or body within which four blades are caused to rotate through the medium of a drum within casing, and whose axis is eccentric to that of the casing.

In fig. 1 (a known construction), the blades A, B, C, D are pivotally mounted on the spindle E, which is rigidly attached to one of the covers of the body, while the blades are driven by the drum F whose ends are carried by a recess in each of the two covers. The drum has a driving shaft at one end extending through a gland in the cover opposite to that to which the spindle is attached; and it is to this drum spindle or driving shaft that a pulley is keyed or other prime mover attached. Power is transmitted from F to the blades by means of slotted rolls G, through which the blades pass; the rolls being free to

rotate in sockets which form part of the roll, thus permitting the axis of the roll to be eccentric to the body or casing. The gas is drawn in at H and discharged at K; rotation of the blades being in the direction of the arrow X. The blades A B are shown in the position of widest separation; B having drawn in a full charge of gas which A is about to discharge; and it will be seen that the end of the suction period and beginning of the discharge period are practically simultaneous.



Elliott and Waller's Rotary Gas Compressors.

Fig. 2 represents a modified form by means of which the beginning of the discharge period is automatically adjusted to a varying discharge pressure; the means employed being a flap valve M controlling an auxiliary discharge port, or a valve of the direct-lift type may be used—thus preventing the gas being compressed by the blades A B to a higher amount than that in the discharge main.

Fig. 3 illustrates a third method for varying the discharge period by means of a slide or valve plate which can be shifted by hand—for instance, by means of the hand wheel P and screw engaging the slide plate so as to uncover or cover one or more of the auxiliary discharge ports Q in the casing. These are arranged in such numbers and varying position as may be deemed expedient to suit varying working pressures —say 2, 3, 4, and 5 lbs. per square inch.

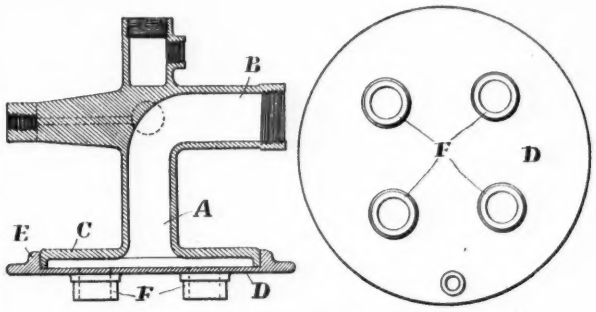
In the present type of apparatus, as the space between the blades occupied by the charge is put into communication with the discharge port almost simultaneously with the termination of the suction period, it follows (the patentees point out) that a portion of high-pressure charge sufficient to establish an equilibrium will flow back from the discharge main into the casing each time a blade passes the discharge. Pressure equilibrium having been established, the whole charge—that drawn in from the inlet main at approximately atmospheric pressure *plus* that which has surged back from the discharge main—is swept out together into the discharge main. In the improved type there is no reflex of charge from the discharge main, as the charge drawn from the inlet is first compressed to the pressure in the discharge before it is put into communication with the discharge.

Incandescent Gas-Burners.

ANDERSON, D., of Farringdon Road, E.C.

No. 13,283; June 5, 1912.

The object of this invention is to avoid explosion on lighting and extinguishing inverted incandescent burners by providing, between the pipe by which the gas and air are supplied and the burners, a flat chamber of considerable diameter and very small depth, arranged substantially at right angles to the gas supply pipe and to the pipe leading to the burners; the burners being arranged at the side of the chamber remote from the inlet pipe, and at points not immediately opposite such pipe, so that the gas and air passing from the supply pipe to the burners has to pass through a narrow passage between the flat walls of the chamber.



Anderson's Incandescent Gas-Burners.

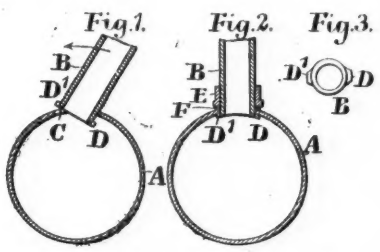
In the burner illustrated, the gas and air mixture is led in by a vertical $\frac{5}{8}$-inch pipe A, at the lower end of which is cast, in one with the pipe, a disc C forming the upper end of a narrow flat chamber. The lower wall of the chamber is formed by a disc D; and the side walls are formed by flanges on the upper and lower discs—the flange E on the lower disc surrounding that on the upper one. The burners F are about $2\frac{1}{2}$ inches apart, and are spaced in the lower side of the chamber. The chamber above the burners is of such dimensions that there is no substantial accumulation of gas and air in it; so that the gas and air passing from the inlet pipe to the burners is in rapid motion through the chamber and never in a quiescent state. Only a slight clearance is provided in the chamber outside the orifices leading to the burners; so that "there is no space in which mixture can remain at rest in the pipes or in the chamber."

Branch Couplings for Main Pipes.

WESTPHAL, C., of Leipzig, Germany.

No. 23,347; Oct. 12, 1912. Convention date, Oct. 13, 1911.

According to this present invention the connection of a branch pipe to a main pipe is effected by providing the branch pipe with two or more projections, and inserting it obliquely through a hole drilled in the main pipe to correspond with the outside diameter of the branch pipe; then turning the branch pipe over so that it is square or centred to the main pipe. While it is in this position (in which it is prevented from falling or slipping out of the main pipe by the projections on the branch pipe bearing against the inner wall of the main pipe) the branch pipe is fastened firmly to the main pipe by a nut on the branch pipe.



Westphal's Branch Coupling to Mains.

Fig. 1 is a cross section of the connection showing the positions of the parts during the insertion of the branch pipe into the main pipe. Fig. 2 shows the completed connection. Fig. 3 is an end view of the branch pipe.

The main pipe A is formed with a hole C rather larger than the outside diameter of the branch pipe B, which is formed with projections D D^1, and is inserted obliquely (fig. 1) into the hole C in such a manner that the projection D is inside the main pipe and D^1 outside. The branch pipe B is then turned over in the direction of the arrow, so as to bring it square with the main pipe; while the projection D^1 also passes through the hole into the main pipe. The branch pipe is then drawn upwards until the two projections bear against the inside surface of the main pipe. The branch pipe which is prevented by the projections from falling out of the main pipe, is then firmly connected to the main pipe by means of a nut E screwed along the screw-threaded end of the branch pipe.

Damages for Electric Shock.

A man who survived what he stated was a 6000-volt shock at the Hammersmith electricity sub-station of the London County Council sued the Council in the West London County Court last Thursday for £235 damages for injury. It was admitted that the Council had penalized the engineer-in-charge for certain negligence in regard to the accident; but it was contended that the plaintiff—a switchboard attendant—was guilty of contributory negligence in not looking to see whether or not a plug was withdrawn, as he must have known of the danger. The pressure was put by the Council at 3750 volts. The Jury awarded £135 damages, with costs.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill brought from the Commons and read the first time : Harrow and Stanmore Gas Bill.

Bills read a second time and committed : Coventry Corporation Bill, Crowborough District Gas and Electricity Bill.

Bill reported : Redcar, Coatham, Marske, and Saltburn Gas Bill.

Bills read the third time and passed : Northampton Corporation Water Bill, Slough Gas Bill, South Staffordshire Mond Gas Bill, South Staffordshire Water Bill.

The Calverley Urban District Council have petitioned against the Bradford Corporation Bill.

The opposition to the Leeds Corporation Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills brought from the Lords and read the first time : Northampton Corporation Water Bill, Slough Gas Bill, South Staffordshire Mond Gas Bill, South Staffordshire Water Bill.

Bill read a second time and committed : Liverpool Corporation Bill.

Bill reported : Mynyddislwyn Urban District Council Bill.

Bills read the third time and passed : Herne Bay Gas and Electricity Bill, Swanage Urban District Water Bill, Titchfield District Gas Bill.

The Canterbury Gas and Water Company have withdrawn their tition against the Mid Kent and East Kent District Water Bill.

DERBY CORPORATION BILL.

Protective Clauses for the Derby Gas Company.

The consideration of this Bill was commenced last Thursday by Section A of the Local Legislation Committee of the House of Commons, under the chairmanship of Mr. MIDDLEBROOK.

The Bill is of an omnibus character, and contains two sections relating to water and electricity respectively. There was no opposition to these portions of the Bill ; and although it was announced that the Derby Gaslight and Coke Company had reserved Counsel, we are able to state that they will not oppose before the Committee. Their opposition was in respect of Part V., which deals with the supply of electricity. It is understood that the suggestion was originally made that the Company should apply for an electrolysis clause for the protection of their mains. This claim has, however, been abandoned. The new electrical powers asked for under the Bill are to lay additional mains, to erect overhead wires, construct a new sub-station, &c. The following two clauses had been put in by agreement with the Derby Gaslight and Coke Company :—

As to Charges for Electricity to Gas Compressing Engines.

Notwithstanding anything contained in this Act, the Corporation shall not charge for any electricity supplied and used for the purpose of working motors used for compressing gas supplied by the Derby Gaslight and Coke Company at a higher rate than the highest rate charged by them for the time being for electricity supplied for lighting purposes.

For the Protection of the Derby Gaslight and Coke Company.

For the protection and benefit of the Derby Gaslight and Coke Company (in this section called "the Company"), the following provisions shall apply and have effect :

(1) In the construction and maintenance of any sub-stations, transforming stations, and other works under the provisions of the section of this Act of which the marginal note is "Power to Construct Electrical Sub-Stations under Streets," and in the construction of any conduits, street boxes, or underground chambers in connection with their electricity undertaking in or under any streets in pursuance of any powers in that behalf conferred upon them, the Corporation shall make reasonably sufficient provision, by ventilation or otherwise, for the escape of any gas which may obtain access thereto.

(2) Nothing in this part of this Act shall authorize the Corporation to enter upon, use, or in any manner interfere with, any private roads, lands, property, or works of or belonging to the Company, and used and occupied by them as a part of, or in connection with, their statutory undertaking, or which shall have been acquired or shall be acquired by the Company for the purpose of and in connection with that undertaking.

With regard to Part IV., which deals with water, powers are taken to increase the rates for supply for domestic purposes specified in section 30 of the Derby Water-Works Act of 1848, to the extent of 4 per cent. per annum upon the rateable value of the premises supplied. This section of the Bill also authorizes the Corporation to lay mains in streets not dedicated to the public use, to repair water-pipes and charge the owner with the cost, to fix detection of waste-water apparatus, to approve of water meters, taps, &c., before use, and a number of other powers for the better administration of the water-works undertaking.

The Committee, who are at present considering the markets portion of the Bill which is opposed, adjourned on Thursday till to-day, and will in due course, as is the custom with a Local Legislation Committee, discuss the clauses of the Bill seriatim, despite the remainder of the measure being unopposed. We shall indicate any modifications made in the sections of interest to our readers.

REDCAR, COATHAM, MARSKE, AND SALTBURN GAS BILL.

This Bill was last Tuesday sent forward by the Unopposed Bills Committee for third reading in the House of Lords.

Mr R. H. FOX (of Messrs. Durnford and Co., Parliamentary Agents) explained that the Bill authorizes the Company to construct additional works and to raise £20,000 additional capital, such additional capital to include any premiums resulting from the sale of stock. The Local Government Board had presented a report on the Bill in which they drew attention to the fact that 12-candle power gas was scheduled, and commented upon this unusual power. This was the same candle power as in the neighbouring town of Middlesbrough ; and the Company had agreed with the Council, to whom they had given a penal calorific clause, on the lines of that in the Wandsworth Bill last year. The Company had also reduced the price of gas, and the shareholders would forego the arrears of dividends.

As mentioned above, the preamble was proved and the Bill ordered to be reported for third reading.

HERNE BAY GAS AND ELECTRICITY BILL.

This Bill was last week before the Unopposed Bills Committee of the House of Commons, and was ordered to be reported for third reading.

The object of the Bill is to confer upon the Herne Bay Gas and Coke Company powers to supply electricity in Herne Bay, at the same time revoking the Herne Bay Electric Lighting Order of 1909. There is, of course, an agreement with the Local Authority as to electricity supply. The Company may raise additional share capital not exceeding £15,000 ; but if within a period of two years after the passing of the Act, or any extension of it, the Company have failed to exercise their powers with regard to electricity, the additional capital which the Company may raise under the Act is to be reduced from £15,000 to £7000. Separate capital and revenue accounts are to be kept of the gas and electricity undertakings of the Company. The provisions as to purchase of the electricity undertaking by the Council are that the Company are to have twelve months' notice at the end of ten, twenty, or thirty years from the passing of the Act ; and the price to be paid by the Council is the total capital expenditure, *plus* the amount equal to 25 per cent. of this expenditure if purchase takes place at the end of ten years, 20 per cent. if the purchase takes place at the end of twenty years, and 10 per cent. if the purchase takes place at the end of thirty years. The Company have the option, within three months of the Council giving them notice to purchase the electricity undertaking, of requiring the Council also to purchase the gas undertaking.

BLYTH AND COWPEN GAS BILL.

This Bill was before the Standing Orders Committee of the House of Lords last Tuesday, in respect of the non-compliance with Standing Orders through late notice of an additional provision, as mentioned in our last issue.

Mr. H. L. CRIPPS (of Messrs. Dyson and Co., Parliamentary Agents) explained that the object of the additional provision was merely to change the name of the Company from the Blyth and Cowpen Gas Company to the Blyth Gas Company ; the change being necessary owing to the amalgamation of the two districts into the one district of Blyth. Nobody was hurt in the slightest degree by the proposed change.

The Committee decided to dispense with the Standing Orders, and allowed the additional provision to proceed.

BRADFORD CORPORATION BILL.

This Bill was under consideration during the past week by a Committee of the House of Lords presided over by the EARL OF BRISTOL ; and we give below an account of the proceedings so far as they relate to the section of the Bill which deals with the Corporation's water undertaking, which was strongly opposed.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. RAYMOND ASQUITH appeared for the Corporation. The opponents to the water clauses were the Lancashire and Yorkshire Railway Company, represented by Mr. J. G. TALBOT, K.C., and Mr. REES WILLIAMS ; the Great Northern Railway Company, represented by Mr. BRUCE THOMAS ; Mr. T. B. Clarke Thornhill, represented by Mr. ST. JOHN RAIKES ; and some eight county and local authorities, who were represented by Mr. J. D. FITZGERALD, K.C., and Mr. W. E. TYLDESLEY JONES.

Mr. BALFOUR BROWNE opened the water section of the Bill on Tuesday afternoon. At present, he said, the Corporation had power to erect two reservoirs—at Lodge and Woodale respectively ; but under the Bill it was proposed to abandon these powers and to erect instead one reservoir near Scar House on the River Nidd, together with the necessary aqueducts, pipe lines, &c. To this part of the scheme there was no opposition. The opposition was to the proposal of the Bill to extend the limits of supply in order to include the following districts : Addingham, Apperley, Bingley, Birkenshaw, Birstall, Burnsall, Calverley, Clayton, Cleckheaton, Denholme, Draughton, Drylingham,

Farsley, Gildersome, Gomersal, Hunsworth, Liversedge, Mickelthwaite, Morton, Pudsey, Queensbury, Shelf, Shipley, Silsden, and Wilsden. The borrowing powers in connection with the new reservoir amounted to £750,000. Whereas at present the Bradford Corporation had the right to supply in the out-districts mentioned above, they had not a monopoly; and the District Councils of Cleckheaton, Birstall, Farsley, Gomersal, and Shelf, and the Rural District Councils of Keighley in respect of the district of Morton, and the Rural District Council of Skipton in respect of the district of Draughton, objected to their existing freedom in the matter of obtaining supplies from other sources being interfered with. A similar feeling had moved the Railway Companies to petition against the Bill, inasmuch as they were now able to obtain water for locomotive purposes from private sources, which they feared they would not be able to do under the Bill. Again, Mr. Thornhill, another petitioner, has a water-works in Calverley; and he sought to protect his rights, although the contention of the Corporation was that he had only the right to supply his own tenants. Speaking as to the position of the local authorities, Counsel urged that the Corporation had spent a large sum of money upon their water undertaking in view of the fact that all the outlying districts could call upon them for a supply, and it was only fair to give the Corporation the exclusive right to supply in these districts. At present, no less than 25 outlying districts were being supplied, including Cleckheaton, which took the water in bulk and distributed it themselves. One of the districts thought that a cheaper supply could be obtained if they sunk their own wells; but if all these districts were allowed to do this, the large expenditure of £500,000 which the Corporation had incurred upon works largely to supply these outside districts would be rendered unremunerative. Hence the Corporation desired to have their limits of supply defined once for all. So far as Cleckheaton was concerned, the Corporation were prepared to take over the distributing pipes, &c., for £17,000, which was the cost to the Cleckheaton Council.

On Wednesday morning, Mr. BALFOUR BROWNE agreed with the railway companies that nothing in the Bill should interfere with their existing rights to obtain water from private landowners.

Mr. *James Watson*, Water-Works Engineer to the Bradford Corporation, was then called formally with regard to the construction of the one reservoir at Scar House, instead of the two for which the Corporation at present had powers.

Negotiations had meantime been going on with a view to meeting the opposition of the local authorities; and during the morning it was announced that terms had been arranged with all of them except Draughton and Morton, whereby the Corporation should have the powers asked for in the Bill; the local councils deciding, however, whether the Bradford Corporation should supply in bulk or in detail. The bulk price was to be agreed or settled by arbitration, and the detail price was to be the same as in Bradford; the Corporation purchasing the local distributing plant, where it existed, at an agreed price, or, failing agreement, by arbitration. The bulk supply terms were to be subject to revision every twenty years.

This only left the opposition of Draughton and Morton, and Mr. Clarke Thornhill. The latter gave evidence to the effect that he wished to have all his existing rights in Calverley maintained. He feared that if the Bill were passed in its present form he would be prevented even from supplying his tenants as he had done for twenty years.

The case for the Corporation was that the Bill would not affect the private rights of Mr. Thornhill, the "exclusive" rights of supply taken in the Bill referring only to local authorities.

The Committee ultimately decided that a clause should be drafted maintaining for Mr. Thornhill all his existing rights.

On Thursday morning, a similar decision was given with regard to the districts of Draughton and Morton, after Mr. FITZGERALD had addressed the Committee on their behalf; the result being that these authorities may call upon the Bradford Corporation for a supply, but the latter cannot prevent the local councils from obtaining supplies from other sources.

The final adjustment of clauses will take place to-day (Tuesday).

PONTYPRIDD AND RHONDDA JOINT WATER BOARD BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, April 22.

(*Before Sir* HARRY SAMUEL, *Chairman*, *Sir* JOHN BARREN, *Mr.* ARNOLD WARD, *and Mr.* ALBERT SMITH.)

The main object of this Bill is to authorize the Pontypridd and Rhondda Joint Water Board to enter into an agreement with the Merthyr Tydfil Corporation, whereby the latter will give a supply of water to the Joint Board; also to empower the Joint Board to construct additional works.

Counsel for the promoters were Mr. J. D. FITZGERALD, K.C., Mr. G. M. FREEMAN, K.C., and Mr. REES WILLIAMS. The opponents were the Caerphilly Urban District Council, represented by Mr. VESEY KNOX, K.C., and the Llantrisant Rural District Council, who were represented by Mr. J. G. TALBOT, K.C., and the Honourable EVAN CHARTERIS.

Mr. FREEMAN, in opening for the Bill, stated that its main object was to confirm an agreement between the Pontypridd and Rhondda Joint Water Board and the Corporation of Merthyr for a supply of water to the Joint Board. It also took powers to make certain new works which will be necessary for taking the supply from Merthyr. In a short history of the position of the Joint Board, he explained that they acquired the old Water Company on Jan. 1, 1911; the total purchase price being £341,226, of which £60,000 represented goodwill. Among the unexercised powers owned by the Company and taken over by the Joint Board was parliamentary authority to construct what is known as the Llia reservoir; and until it was seen that an agreement was possible with Merthyr for a further supply of water, it had been the Joint Board's firm intention to construct this reservoir. Circumstances in South Wales, however, during recent times had rendered it difficult to raise the necessary money, for the Board had already had to obtain large sums for the purposes of the undertaking. The scheme of the Bill was that for the present the construction of the Llia reservoir should be postponed, and the more economical course adopted of taking a supply in bulk from the Merthyr Tydfil Corporation, who, under an Act obtained in 1911, were about to construct a large new reservoir. The agreement, which is scheduled to the Bill, is for a minimum of 1,000,000 gallons per day, with a maximum of 2,000,000 gallons per day, as soon as the reservoir was complete. The two opponents to the Bill were the Caerphilly Urban District Council and the Llantrisant Rural District Council. The circumstances of these two districts were that, whereas Caerphilly was in the area of supply of the Joint Board, it was not represented upon the Board, nor was it involved in the annual deficit which the Board had shown since their formation. On the other hand, Llantrisant was in the area of supply only for bulk purposes; and there was an agreement by which the Llantrisant Rural District Council took a certain minimum quantity from the Joint Board. The old Company had certain powers to increase the rates to consumers, as one of the conditions of the granting of the powers to construct the Llia reservoir; and one of the proposals of the Bill was that the Corporation should have the right to exercise these powers, even though the construction of the Llia reservoir was to be postponed for the present. To this the Llantrisant Council objected; while the Caerphilly Council took the opportunity of asking to be allowed to purchase the portion of the Joint Board's undertaking in their area. The deficiency on the undertaking for the past 15 months was £8000; and inasmuch as both Caerphilly and Llantrisant were a definite source of revenue to the Board, there was naturally the strongest objection to cutting them out of the area of supply.

In answer to the CHAIRMAN, Counsel stated that the contract with the Merthyr Corporation was that a supply should be given in January, 1921, when it was anticipated the Merthyr Corporation's own reservoir would be completed. The price was 3d. per 1000 gallons.

Mr. *W. R. Nicholas*, the Clerk to the Joint Water Board, gave evidence in support of the Bill.

Mr. TALBOT, in cross-examination, made the point that one of the reasons for the present prices in the agreement between Llantrisant and the Joint Board was the expense of constructing the Llia reservoir; but now the Joint Board proposed to abandon this, and to purchase water in bulk on much cheaper terms than they could get it for themselves if they constructed the Llia reservoir. Under these circumstances, Llantrisant claimed that they should be relieved from the agreement which they entered into with the Joint Board, and that they should either be free to obtain a supply for bulk purposes from other sources, such as Merthyr, or that the price at which they would be supplied by the Joint Board should be reduced. Counsel said he had a firm offer from Merthyr to supply at 4d. per 1000 gallons.

Witness replied that this 4d. was for water delivered at the same point as the Joint Board would receive it at 3d. per 1000 gallons.

Mr. TALBOT said that all he claimed was the right to be able to obtain his water cheaper than he could get it under the existing agreement with the Joint Board, seeing that the Board had abandoned the construction of the Llia reservoir, which was the only reason why Parliament allowed them to charge the prices in the present agreement.

Wednesday, April 23.

When the proceedings were resumed this morning,

Mr. VESEY KNOX cross-examined witness on behalf of Caerphilly. The trend of his questions was that the Council desired to have the distribution of the water in their own district in their own hands. His opposition to the Bill would be withdrawn if his Council were granted a purchase clause. He would be willing, under such a clause, to come under an obligation to take a supply in bulk from the Joint Board for that portion of Caerphilly now supplied by them; but he wished to have the distribution in his own hands.

Witness having once more reiterated that the Joint Board had a strong aversion to cutting out any part of the district,

Mr. FREEMAN announced that there might, after all, be a possibility of the Joint Board agreeing with both parties if an adjournment could be granted.

The Committee thereupon adjourned for an hour.

On re-assembling,

Mr. FREEMAN said he was happy to be able to tell the Committee that they had arranged the following terms with the Llantrisant Council, subject to the approval of the Committee—namely, that the price for supply in bulk should be 5¾d. per 1000 gallons after the Merthyr Corporation commenced their supply to the Joint Board under the agreement scheduled to the present Bill. Until that time the price to Llantrisant would be 7d., as at present. The Llantrisant Council were to take a minimum quantity of one-third of a million gallons per day, and a maximum quantity of one million gallons per day.

Mr. VESEY KNOX, speaking with regard to Caerphilly, said that terms had also been arranged with that body. The Caerphilly Council were to have the power to purchase the portion of the Joint Board's undertaking in their district—the price, failing agreement, to be fixed by arbitration; but it was to be based upon the value of the pipes in the district, *plus* a proportion of the goodwill which the Joint Board purchased from the old Water Company. The Joint Board were to supply the Caerphilly Council in bulk at their boundary with a minimum of 50,000 gallons per day and a maximum of 150,000 gallons per day; the price to be the same as in the agreed terms with Llantrisant—namely, 7d. per 1000 gallons until the supply was given by Merthyr, when it would be reduced to 5¾d. per 1000 gallons.

The CHAIRMAN said the Committee thought the arrangements come to with the two opponents were such that they should sanction.

Mr. FREEMAN pointed out that there was no opposition to the remainder of the Bill.

The CHAIRMAN, however, said there were a number of matters which the Committee must discuss with the promoters. In the first place, there was a question as to whether the promoters had definitely abandoned the construction of the Llia reservoir.

Mr. *Nicholas*, recalled, stated that this was not so, although the construction of the reservoir was postponed for a period to which he could place no limit. At the same time, the Board felt very strongly

that they should retain the powers to construct the Llia reservoir, owing to the possibility of damage to their existing sources of supply from subsidences from the coal measures.

Some discussion then took place as to the period of sixty years asked for in respect of the repayment of the loan for the new works authorized by the Bill. The Local Government Board reported in this connection, and suggested that the period was too long; but Mr. Nicholas pointed out to the Committee that the works proposed were extensions of existing works, for which a period of sixty years had already been granted as recently as 1910.

The Committee agreed to the same period in this case also.

The Local Government Board also reported with regard to the period of five years suggested for the repayment of the costs incurred by the Joint Board in opposing the Rhymney Valley Water Board Bill, 1911, and the Merthyr Tydfil Corporation Water Bill in 1911. The Local Government Board rather took the view that such expenses should be paid for out of revenue; but Mr. Nicholas again pointed out a precedent, inasmuch as all the other authorities in South Wales who opposed these Water Bills in 1911 received seven years, and that as two years had elapsed, the period of five years now asked for would place the Pontypridd and Rhondda Joint Board in the same position as the other opposing authorities. The Local Government Board had pointed out that there was no precedent for the proposal; but

The CHAIRMAN, in giving the Committee's assent to the proposal, said he would make a special report to the House on the subject; pointing out that there were precedents.

Friday, April 25.

The consideration of the clauses was taken in hand this morning.

Mr. TYLDESLEY JONES, on behalf of the Caerphilly Council, asked or the insertion of words in the clause put forward, and which was based on the agreement arrived at earlier in the week, to the effect that the Council could, after the maximum of 150,000 gallons per day had been reached, construct works to develop local sources of supply.

Mr. FREEMAN strongly objected, and appealed to the Committee to insist upon the wording of the clause being in strict accordance with the speech of Mr. Vesey Knox. [It so happened that only two members of the original Committee were present—two changes having been made for the next Bill in the group.]

The CHAIRMAN, under the circumstances, decided that he could not vary the terms of the agreement already arrived at.

The Bill was then ordered to be reported for third reading.

WEST HAMPSHIRE WATER BILL.

HOUSE OF LORDS COMMITTEE.—Thursday, April 24.

Before the Marquis of BRISTOL, *Chairman, Lord* RAVENSWORTH, *Lord* MONTEAGLE, *Viscount* HOOD, *and Lord* PLUNKETT.)

The consideration of this Bill was commenced to-day. The measure only deals with the capital of the Company.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. F. N. KEEN appeared for the promoters, the West Hampshire Water Company. The only opponents to the Bill were the Bournemouth Corporation, who were represented by Mr. VESEY KNOX, K.C., and Mr. G. W. BAILEY.

Mr. HONORATUS LLOYD, in opening, explained that the Company were incorporated in 1893. The total capital authorized was £100,000, with borrowing powers amounting to £25,000. Of these amounts, £62,582 had been raised by way of shares and £13,635 under the borrowing powers. There had, however, been certain irregularities in the creation of the capital, in the matter of calling meetings, &c., and it seemed to the Company that the best way to put things right was to come to Parliament to have the capital issued sanctioned as if there had not been the blunders to which he had referred. What had happened, however, had not hurt anybody in the least degree. The sole object of the Bill was to regularize the creation and issue of the Company's capital. The Bournemouth Corporation had taken the opportunity of presenting a petition against the Bill; and their right to do so was because part of the County Borough of Bournemouth was within the Company's area. The petitioners alleged that the Company had not provided a proper supply of water; and they asked that conditions should be put into the Bill to secure a sufficient and proper supply in the future. The suggestion was also made that the Corporation should be given purchase powers over that part of the Company's area in Bournemouth, and, finally, they made some suggestions against the financial position of the Company. It was alleged that there was no provision for depreciation in the Company's accounts; but he did not know of any water undertaking in which this was done.

Mr. *G. St George Moore*, the Engineer to the Company, spoke as to the efforts to improve the purity of the water supply; no less a sum than £10,000 having been spent in unsuccessful attempts to sink borings. As a matter of fact, no successful well had been sunk in the West Hampshire area, and the Company had been driven back practically to the River Avon as their main source of supply.

Friday, April 25.

Witness continued his evidence this morning, and said that the capital expenditure on the Company's works was £25,570; on wells, £4610; on mains, £39,288, which, together with parliamentary expenses, made a total of £75,405. The capacity of the plant was sufficient for a population of 46,500; whereas the actual population of the Company's area was only 24,000. The alleged main sources of contamination of the Company's supply were Soffley Brook and the Ringwood main outfall. He had examined the supply at both places, however, and had failed to detect any human excreta.

Mr. VESEY KNOX cross-examined at very considerable length, on behalf of the Bournemouth Corporation, the burden of his questions being the great importance of a pure water supply in a health resort such as Bournemouth. Witness admitted that unsatisfactory analyses had been made by Sir James Dewar, Dr. Thresh, and Sir James Stevenson; but he maintained that there was nothing to complain of now. At the present moment, Candy pressure filters were being installed with a view to improving the water. Under the Act of 1893, the Christchurch Corporation had the right to purchase the whole of the Company's undertaking; and in that event, the other local authorities could compel Christchurch to sell to them the portions of the area in their respective districts. Counsel suggested that Christchurch was hardly a large enough authority to take over the undertaking, and put it to witnesss that the Company would be in no worse position if Bournemouth was substituted for Christchurch. During the course of further questions, witness complained of the absence of powers on the part of the Company to compel the local authorities who discharge into the River Avon to instal sewage plant in order that crude sewage should not be sent direct into the river. As a matter of fact, the Hampshire County Council were now taking some steps in this direction.

In re-examination, witness said the Company at present had strainers and sand filters. Originally polarite was used for the strainers; but this had since been abandoned, and the strainers or roughing filters were now being replaced by pressure filters. The sand filters were also being attended to; and when these works were completed, there could be no cause at all for complaint. During the typhoid scare at Ringwood last year chlorination was adopted, and had been most successful. The Company proposed to keep the process in reserve in case of any similar scare in the future. As to sedimentation, witness said he disagreed with this as applied to the water which the Company had to deal with, although he agreed that his objection was also partly on the ground of expense.

Mr. *Henry Rofe*, consulting engineer, said the works were in good order, and the watershed in the Company's area was, in his opinion, an uncommonly clean one. When the pressure filters were installed, and if the sand filters had 2 ft. 6 in. of sand on them, there would be ample protection against any possible danger. He agreed with Mr. Moore that sedimentation would be needless with the River Avon water, although in the case of London it was essential, owing to the conditions under which the Metropolitan Water Board took their supply from the Thames. The double filtration process was much the best for the River Avon. As to the nature of the crude sewage flowing into the river, he pointed out that whereas the proportion was 1 in 20,000, the Royal Commission on sewage disposal recommended 1 in 500 as a safe limit. Personally, he had never seen a better stream than the River Avon, and he failed to see any necessity for the Company to worry about getting underground water.

In cross-examination by Mr. BAILEY, witness said that, under the conditions of the Company's supply, storage was quite unnecessary.

Dr. *J. C. Thresh* said he was called in by the Company in September, 1912, and his examination of the River Avon had caused him to come to the same conclusion as Mr. Rofe. His first analyses of the water, however, were not satisfactory, and he made certain recommendations which included double filtration in preference to storage. The Company had acted upon this advice; and when his recommendations were carried out, their water would be second to none.

Cross-examined by Mr. VESEY KNOX, on behalf of the Bournemouth Corporation, witness handed in the results of some tests, which showed that in all respects the Avon water was slightly better than Thames water. Counsel made a strong point of the argument put forward on behalf of the Company that storage of river water was undesirable, and claimed that this was the first time such a claim had been made. Witness, however, maintained that there was much evidence to show that stored water became unfit for drinking purposes. In the chlorination process, which was used last year, the dose of chlorine was one part per million, and the period of contact was half an hour. His opinion was, however, that a quarter of an hour was sufficient in ordinary cases.

In re-examination, witness said the water was at present perfectly satisfactory, although the new filters were not yet at work. In view of this, he recommended the Company to agree to a similar clause to that in South-West Suburban Company's Act, under which the Company would be liable to a penalty of £10 a day for supplying impure water.

Mr. HONORATUS LLOYD added that the Company would also be willing to come under an obligation to use double filtration. This double offer, however, did not appear to meet the opposition of the Bournemouth Corporation.

Professor *Sims Woodhead*, Professor of Pathology at Cambridge University, confirmed the views of Dr. Thresh as to the nature of the Company's source of supply, and generally expressed himself satisfied with their water. The chlorine process was a third line of defence to the Company in case of any epidemic occurring again; and he recommended that it should be kept in reserve. With this, and the two filtration processes, storage would be quite unnecessary.

Mr. *L. C. Walker*, the Water Engineer and Manager to the Reading Corporation, spoke as to the satisfactory results of the adoption of the chlorination process at Reading, and also, on his advice, at Truro. Bacillus *coli* was always present at Reading in the river water before treatment; but its presence could not be detected after the chlorine treatment. He agreed with the previous evidence as to the West Hampshire undertaking.

In cross-examination, Mr. VESEY KNOX brought out the fact that the chlorination process was in constant use at Reading; whereas the West Hampshire Company were only proposing to keep the process in reserve. Witness replied, however, that he had found the process more economical than sand filtration.

Mr. HONORATUS LLOYD said that if the Bournemouth Corporation desired the chlorine process to be used permanently, the West Hampshire Company were willing to agree to do so.

Mr. *D. Llewellyn*, the Secretary and Manager of the promoting Company, was then called.

At the commencement of his evidence,

The CHAIRMAN said the Committee had some doubt as to what the Bournemouth Corporation were out for.

Mr. VESEY KNOX said that the Corporation, on the advice they had

received, believed that nothing but storage could make the water supply of Bournemouth satisfactory. If the Company were not willing to undertake the cost of storage, then the Corporation asked for a purchase clause, either as regards the portion of the Company's area in Bournemouth or as regards the whole of their area. The Corporation felt that the matter should be put upon a satisfactory basis in the interests of the welfare of the town.

Mr. HONORATUS LLOYD, for the promoters, asked the Committee not to consider the proposal as to purchase, because if the Corporation purchased the whole undertaking, objection could be taken by all the other local authorities concerned. Further, the Bournemouth Corporation had not consulted the ratepayers on the matter.

Mr. *Llewellyn* then proceeded with his evidence, and spoke as to the outbreak of typhoid at Ringwood last year, and the adoption of the chlorination process as a temporary measure. The dividend of the Company had never exceeded 2½ per cent.

We regret that in the report of the proceedings on the South Staffordshire Water Bill which appeared in the "JOURNAL" last week (p. 268), the name of Mr. G. H. Hill was inadvertently given instead of that of Mr. H. Ashton Hill as the Engineer-in-Chief of the promoting Company.

LEGAL INTELLIGENCE.

The Alleged Breach of a Coal Contract.

Last Tuesday the action of *Michael Pintus and Sommerfeld, Limited, v. H. S. Higginbottom, Limited* [see *ante*, pp. 189, 269] again came before Mr. Justice Scrutton. As already reported, his Lordship had found that the defendants had broken their contract, but that the damages were merely nominal; and he expressed his willingness to hear further evidence if the parties so desired. Both sides having stated that they were prepared to leave the matter to His Lordship, judgment was entered for the plaintiffs with 40s. damages, with costs attributable to the action in which plaintiffs alleged only a breach of contract in respect of the matters in which the Judge had found the coal was not in accordance with the contract, except so far as these costs were costs of discovery, which were not to be allowed to plaintiffs; defendants to have the costs of the other issues. There would be a set-off as to costs. The matter came again before his Lordship on Friday, when Mr. Leck, for the plaintiffs, applied that the costs should be on the High Court scale. The application was opposed by Mr. Leslie Scott, K.C., M.P., who represented the defendants. After some argument his Lordship granted a certificate for costs on the High Court scale.

Metropolitan Water Board and their Contractors.

In the Official Referees' Court of the High Court of Justice a few days ago, a settlement was announced in the case of *Pethick Bros. v. Metropolitan Water Board*. Originally Messrs. Pethick Bros., of Plymouth, had sued the Board on the allegation that they had wrongfully terminated a contract under which the plaintiffs were to carry out filter-bed and reservoir construction at Long Ditton, Surrey. The defendants contended that the contract was not unlawfully abandoned, and that they were justified in terminating it, inasmuch as there had been delay in doing the work, and that they had had to employ other contractors to finish the job. Mr. Pollock, before whom the case was tried, had decided that the Board were legally justified. [See "JOURNAL" for Dec. 31, 1912, p. 1057.] The case had come before him on an inquiry as to what sum the plaintiffs were entitled to—a certain figure having been agreed upon for work that had been done prior to the termination of the contract. He had also to determine the question of the Board's counterclaim. Mr. Gregory, K.C., said he was happy to state that the case had been settled on terms endorsed on counsel's briefs; and the Official Referee made an order staying all proceedings on the claim and counterclaim.

A Manchester Compensation Case.

Before Judge Mellor, K.C., at the Manchester County Court last Tuesday, the Manchester Corporation applied for the termination or a diminution of the compensation of 15s. 9d. a week awarded to a gas stoker named Thomas Coupe, in respect of incapacity arising from an accident at the gas-works in February of last year. The contention of the Corporation was that the man had only suffered from lumbago, and had now entirely recovered. For the respondent, on the other hand, it was asserted that his sciatic nerve had been stretched by a twist, and that he was now only fit for lighter work than that suggested for him by the Corporation. Coupe said he had not accepted a bed offered at the Royal Infirmary, because his own doctor had told him the treatment for lumbago to which he would there have been subjected would not have done him any good. He admitted that on three days last October he indulged in street betting, was arrested, and paid a fine of £10 and costs. After consulting Dr. Ray, who sat as Medical Assessor, and privately examined the man, the Judge said there was no doubt at all that the man had recovered, and that the Court would not have been troubled with this case if, instead of lolling about the streets and indulging in street betting, Coupe had taken the advice given him to be treated in the Infirmary. The compensation would be terminated at once.

There has been an exhibition of gas-fires and cooking ranges in the Arcade Hall, Barnsley, and it will continue till to-morrow. Mrs. Margaret Dunn is giving free lectures on gas cooking, with demonstrations.

MISCELLANEOUS NEWS.

THE RECENT GAS STRIKE IN SYDNEY.

We have received from Sydney (N.S.W.) a number of papers covering the period of the recent strike of stokers in the employ of the South Australian and North Shore Gas Companies. The effect of the action on the part of the men was briefly, but graphically, described in the extract from a letter received by Mr. A. C. Scrivener, of Birmingham, from his son, which appeared in the "JOURNAL" last week (p. 278).

CAUSE OF THE STRIKE.

First, as to the cause of the strike. According to a statement made by the Secretary of the Gas Employees' Union (Mr. Rawlin), as far back as September last an application was made for an extra 1s. per day all round, in consequence of the increased cost of living and the high rents. The men were working under agreements, and the Companies concerned declined to alter them by granting the demand, especially in view of the fact that the Government were dealing with gas legislation, the effect of which was uncertain. The men then decided to go to the Government, to see if they could afford any assistance. Hopes were held out, and Mr. Rawlin had several interviews with the Premier and the then Minister for Labour (Mr. Beeby). Before the Gas Bill became law, a mass meeting of the men was called early in October, and a resolution was passed to the effect that the Secretary was to approach the Government, and if he failed to get satisfaction a ballot of the men was to be taken. This was done many weeks later—when the Government had failed to do anything for the employees. The Minister for Labour then stepped in, and served the Secretary and President of the Union with an injunction restraining them from making any movement in the way of a strike. In consequence, the ballot-papers were never opened. When the Gas Bill became law, the Conciliation Committee was called together; but the Companies' representatives declined to vary the agreement, and told them they would have to go to the Arbitration Court, before whom the Companies would give them every assistance. This course was supported by the Industrial Registrar (Mr. J. Holme); and it was adopted—an affidavit for variation of the agreements being duly filed. The application was made under section 14 of the Industrial Arbitration Act, 1912.

The application was heard by Mr. Justice Heydon, who gave his decision on the 27th of February. He said the Court had been asked to sit as a Wages Board to determine the matters in dispute between the Gas Employees' Union and their employers. No Wages Board had been constituted to deal with this branch of the gas industry; and he entertained grave doubts whether the Court had any jurisdiction to act in such capacity. The employees of the companies concerned were working under agreements which were in force until September, 1914. The first point to consider, therefore, was whether a Wages Board had any power to vary the provisions of an industrial agreement. Having looked over the Act, and listened attentively to the fair and full arguments of the representative of the employees, it seemed to him clear beyond all question that the Legislature intended that such agreements should be binding on the parties, unless they themselves mutually agreed to change them. If he were to award the men increased wages, and the Companies were to pay them, and then attempt, under section 20 of the Gas Act, 1912, to charge a higher price for gas, the attempt could, in his opinion, be successfully resisted. The gas rate could only be raised against the public after the action of a Wages Board, because only such a Board could be expected to recognize a duty to the public. In the face of section 20, it was clear that, in applications by the Union for higher wages, the Union stood face to face, not with the Gas Companies, but with the purchasers of gas. If a Wages Board were to give the men the shilling a day extra all round, for which they asked, and to which, as a matter of fairness, they might, in fact, but for their agreement, be entitled, the amount would at once be provided by the gas buyers. Householders would have larger gas bills, and penny-in-the-slot consumers would get less gas for their penny. Advances in wages, unless the workers earned them by the increased productiveness of their labour, must come out of somebody's pocket. The same consequence followed in all cases in which the increase could be passed on; but it was not always seen quite so plainly. The application was therefore dismissed.

THE STRIKE BEGINS.

In the words of a member of the Union, the men were "thoroughly disgusted" with Mr. Justice Heydon's decision; and the disgust very soon showed itself in action. The men employed at both the Mortlake and North Sydney Gas-Works went on strike at midnight on Thursday, the 27th of February; and notwithstanding conciliatory efforts put forth by Mr. E. J. Kavanagh, a member of the Legislative Council, and Secretary of the Labour Council, and others, the disaffection spread to the employees at the Kent Street station, with the result that work in the retort-house ceased there also. The city was put upon a minimum supply; and, used as sparingly as possible, there was only enough gas at Mortlake to last for seven hours. North Sydney was not in so desperate a plight; for with volunteers, including one of the Company's shareholders, there were about fifty men charging and drawing the retorts at the North Shore works. Mr. Kavanagh and two other delegates from the Union had an interview with the Directors of the North Shore Company, with the view of having the agreements cancelled, in order to allow the men to apply for a Wages Board. But the Company would not agree to anything of the kind. All they would do was to take back the men who had left, if they would undertake to put in writing anything they had to suggest, and send it in. Meanwhile men had been advertised for.

ATTEMPTS AT CONCILIATION.

On Saturday, the 1st of March, the Minister for Labour and Industry (Mr. Carmichael) addressed the men at the Trades Hall, and put before them a proposal that they should return to work, that the Government should amend the Arbitration Act to permit of the matter

in dispute being dealt with by a Wages Board, and that any award which the Board might make should be retrospective. He pledged his reputation and that of the Government that, if the men went back to work, he would get Parliament together as soon as possible in order that the Act might be amended to provide for a Wages Board, and the men would then be paid the shilling a day increase from the preceding Friday. Parliament could not be called together for at least three months; but the Government would guarantee that the men would be paid the back-money. When the men were asked if they would accept this, there were cries of "Yes" and cheers. The meeting then agreed to the proposals with loud cheers. Having done so much, Mr. Carmichael, together with Mr. Rawlin, left the hall, and waited on the representatives of the Company. Shortly after six o'clock they returned, when Mr. Carmichael intimated that the Companies had agreed to the proposals with regard to a Wages Board; but he proceeded to say he had made a mistake at the previous meeting in guaranteeing the men the shilling a day increase. The announcement was greeted with jeers. Mr. Carmichael retorted that he had done his best, and that if the men did not like the agreement he would tear it up for them. "Tear it up!" shouted defiant voices; and the meeting broke into uproar. There was some excitement for a few moments; and in the end the men marched out of the hall apparently much dissatisfied.

The Premier (Mr. M'Gowen) was seen at a late hour the next (Sunday) night. He stated that the Companies had agreed to leave the terms of the agreement open till two o'clock the following day, and no longer. In order that there might be no mistake he specified the terms of the agreement, as follows: "The Arbitration Act to be amended as soon as Parliament meets, to enable an award to be given in the matter of wages and conditions. All increases so granted to be payable for time worked from Friday, Feb. 28, and to be paid in a lump-sum as soon as the award is given. Men may sign on and start at any hour prior to the time mentioned. Existing rights of seniority to be preserved. No victimization. All positions to remain open till the time mentioned." These terms applied to the employees of the Australian and the North Shore Companies.

It was pointed out to the men that, under the agreement, they were placed in practically the same position as they would have been if Mr. Justice Heydon had made an award instead of giving the decision he had done. The Premier uttered a powerful appeal to the men to be reasonable. He said: "The domestic operations of nearly three-quarters of a million people are most seriously interfered with; and as light is the greatest protection of the citizen in the night time, no body of police can make up for the loss in that direction in the security of the community. Any body of reasonable men would hesitate to bring about such a tremendous interference with the welfare of the whole community, even under circumstances that were otherwise hopeless, and which pressed upon them to an unbearable extent. But where, as in the present circumstances, redress of grievances is certain, speedy, and retrospective, I cannot imagine the men will have any hesitation in accepting the terms offered. As head of the Government, I call upon them to return to work before the expiration of the time mentioned, because they have to recognize that the wants of the community cannot be long postponed. Speaking with a full knowledge of the facts, I am convinced that a settlement so favourable from the men's point of view cannot recur. In their own interests, I strongly urge them to take advantage of the offer without delay."

Rejection of the Proposals.

The members of the Union had a meeting on the 3rd ult. to consider Mr. Carmichael's proposals for the settlement of the strike. The President (Mr. Farrell) occupied the chair and there was a very large attendance. Mr. Kavanagh was present, and urged the men to support the Government. He said this course would be in their best interests, as, by adopting it, they would secure a Wages Board which they said they desired. Moreover, any increases granted would be retrospective. The result of the meeting was the passing of the following resolution: "(*a*) That the agreement with the Companies be cancelled; (*b*) that new agreements be entered into covering all matters other than awards; (*c*) that the employers and the Union jointly apply to the Court for a Wages Board; (*d*) that the Companies offer no opposition to the 1s. per day advance; (*e*) that the men do not resume work until the agreement is signed; (*f*) the new terms to be made retrospective as from the time of the men resuming work; (*g*) the men to be reinstated in their former positions, and no members of the Union to be victimized in any way." A deputation, including the President and Secretary of the Union, waited upon the Directors of the Australian Gaslight Company and put the men's decision before them. The demands embodied in the resolution were carefully considered by the Directors, who struck out the clauses pledging them not to oppose the shilling a day advance and agreeing to a retrospective payment, and, with regard to the others, replied that, provided the men returned to work at once, they would be placed before a Board of the three Companies concerned, and, if possible, an answer given not later than the following Thursday. The decision was forwarded by the Secretary of the Company (Mr. R. J. Lukey) to the Secretary of the Union, who replied that the proposals had been carefully considered by the men, and refused practically unanimously.

When a message was received by the Industrial Registrar that the men had declined Mr. Carmichael's offer, the Premier at once summoned his colleagues, and subsequently Mr. Carmichael forwarded a letter to the Secretary of the Union. This letter was read at a mass meeting of men, and there the matter ended. As soon as the members of the Government became convinced of the obduracy of the strikers, a meeting of the Cabinet was again convened, and it was decided to issue the following proclamation, signed by the Premier: "A fair and reasonable proposal from the Government for the settlement of the dispute having been refused by the men concerned, and the welfare of the general public being jeopardized by the non-supply of gas for the community, I, as head of the Government of New South Wales, with the advice of my colleagues, now call upon the citizens of Sydney to meet the public interest by aiding the Government to keep order and by securing a gas supply for the public."

Combating the Strikers.

In response to the appeal of the Government and the advertisements of the Gas Companies, there was a good supply of outside labour to keep up the supply of gas. On the day after the decision of the men, volunteers were being taken on, and distributed by degrees to positions. They worked in three shifts. The first lot went on from 6 a.m. till 2 p.m.; the second, from 2 p.m. till 10 p.m.; and the third, from 10 p.m. till 6 a.m. the following morning. There were upwards of 100 men employed at the city works of the Australian Gas Company, and this number was being increased by degrees. At night the staff of the head office joined the ranks; about twenty young fellows going off to the Mortlake works. Mr. Lukey told a Press representative that the volunteers comprised men engaged in all sorts of professions; while civilians were coming in and doing short shifts. "The loyalty of the office staff, too," he said, "is beyond expression. We are quite satisfied with the way in which volunteers are coming forward; and we expect there will be 300 men offering their services. Our Kent Street gasholder is rising very perceptibly; but, of course, the fires and retorts have to be heated to a certain condition before the making of gas can be commenced. The volunteers are making splendid headway; and if the present rate of progress continues for a few days, it is probable gas will be available for the public." At Mortlake there were about fifty volunteers; and operations were proceeding steadily at the North Sydney works.

The Lord Mayor of Sydney (Alderman Cocks) announced his intention of calling a public meeting in the Town Hall for the following day (the 5th of March), for the purpose of considering what steps should be taken in the public interest in connection with the stoppage of the gas supply. The Mayor of Parramatta (Alderman Collett), following this example, called a meeting of volunteers, to be held at the Town Hall, Parramatta.

An important minute was passed by the Executive of the Sydney Labour Council, practically declaring against the extension of the strike. The Council said: "We call upon all unionists to refrain from taking any action by way of a sympathy strike before consulting the Council. By localizing the trouble, you will be in a better position to give effect to your principles, and be enabled to provide funds for the support of the wives and children of the men out of work, which it is our duty to do under all circumstances." The Executive at the same time expressed regret at the action of the Gas Companies in refusing to cancel their agreement with the Union, in view of the fact that a Wages Board could not be appointed while the agreement existed, or until the Arbitration Act had been amended.

There was an enthusiastic, and at times riotous, meeting at the Town Hall next day, under the chairmanship of the Lord Mayor. The President of the Chamber of Commerce (Mr. H. Y. Bradon) moved the following resolution:—

> "That this meeting of citizens views with grave apprehension and alarm the action of employees engaged in the production of gas, in plunging the city and suburbs into darkness, stopping numerous industries, and causing misery and deprivation to the sick and needy. That this resolution be conveyed to the Government by the Right Hon. the Lord Mayor, with the request that steps be taken adequately to protect the citizens in any attempt to restore the daily life and industrial activities of the community to normal conditions."

The resolution was seconded by the President of the Employers' Federation (Mr. E. H. Buchanan), and carried by an overwhelming majority. The President of the Chamber of Manufacturers (Mr. Hitchman) then moved:

> "That this great meeting of citizens of Sydney, representing, as it does, commerce and industry in all varied phases, volunteers in a body to assist in restoring to the community its daily light and power. That the names of those present be enrolled, and that the Right Hon. the Lord Mayor is authorized and requested to hand such list to those in control of the industries so involved, with the request to call upon the volunteers as they may deem necessary."

This motion was carried by a large majority. The Lord Mayor announced that he had received from the University of Sydney an intimation that about sixty undergraduates were available as volunteers. He also held in his hand an offer from a gentleman who would himself assist, and bring as volunteers twenty of his friends. His Lordship added that they were not going to take threepence for their work, but would take up the billets of the men, and hold them till they came to their senses, and went back again. "We want the gas," he said, "and are prepared to work for it." Someone in the meeting called out: "And how much a day will you get out of it?" The Lord Mayor replied: "How much a day? I'll tell you how much a day—the love of our country." The reply evoked loud cheering.

When the meeting closed, the Lord Mayor called for volunteers to hand in their names. The response was a remarkable one. Men rushed to the platform, and names and addresses were handed in by persons willing to assist in keeping up the supply of gas. The arrangements made were that clerks and labourers in other employment should take four-hour shifts, while others who were able to do so were asked to work eight-hour shifts.

Just as things were looking a little brighter, there was unfortunately a fresh development of trouble by the strike of between thirty and forty men at the Manly Gas-Works on the afternoon of the 5th of March. However, it was thought that there would be no stoppage in the supply of gas, as the three large holders were full, and the Manager (Mr. J. A. M'Auliffe) was almost immediately applied to by a number of volunteers, who were at once taken on, and started work. The announcement of the strike came as a surprise to the Manager, as it was understood that the men were satisfied with their conditions. They struck work before he had a chance of speaking to them, and left him alone with the foreman.

The volunteers in the other gas-works stuck manfully to their duties, and the result was shown by the restoration of a supply of gas in North Sydney. At night it was turned on in the main streets; but only a few lamps were lighted in order to conserve the supply as far as possible. At the gas-works, operations were being carried on briskly, and apparently with considerable satisfaction. Men were arriving there throughout the afternoon, ready to start work when wanted. Many

were actually in search of work, and others were volunteers for the occasion. All were in the best of spirits. The Manager (Mr. Morland) expressed satisfaction with the position of affairs, and seemed confident that the supply of gas would be maintained.

All the men employed at the city works of the Australian Gas Company were well looked after, though to many of them the work was somewhat hard. One section of the carbonizing plant, comprising 230 retorts, was in operation on the 5th of March, and others were being prepared. Since the free labourers and volunteers commenced work, they had made 5 million cubic feet of gas; and the holder was raised six sheets on the above-named day. Interviewed regarding the position at the works, Mr. Lukey said: "I think we are making satisfactory progress. We have now between 300 and 400 men at work, and there are numbers offering their services. In fact, we have plenty of men coming forward suitable for all the different classes of work for which we require them; and they are all working heartily and enthusiastically." The Lord Mayor showed that he was in real earnest when he announced that he would stoke, for he donned a fireman's outfit, and, accompanied by Mr. Lukey, went down to the city works. In his shift were several prominent citizens. They lit up thirty fires, and worked at them till six o'clock in the evening—remaining the full limit of four hours, and finishing up in splendid condition. He frankly acknowledged, however, that stoking retorts was "no child's play."

A Brighter Outlook.

On the morning of the 7th of March there was a more hopeful outlook in the direction of a settlement of the gas strike. Negotiations had been reopened the previous day between the representatives of the men and the Government, and late in the evening Mr. Carmichael advised the Union Secretary by letter that the Premier desired representatives from both sides to meet him next afternoon. In view of this fact, the Labour Council decided to postpone further discussion of the matter which had brought about the crisis. Meanwhile, plenty of volunteers were offering their services; and the manufacture of gas was proceeding. The supply was being maintained at North Sydney; but at Mortlake there was trouble owing to the men working under contract objecting to the presence of free labour. The example set by the Lord Mayor of Sydney aroused a desire on the part of other Mayors to help in the retort-house. The Mayor of Manly (Alderman Bonner) went down to the gas-works for the purpose; but the Manager could not find a vacancy for him. He left after intimating that he would return later and start work if required. The Mayor was not the only one to the front. The Company's Secretary (Mr. Neilson) went to the retorts during the previous Wednesday night, and worked like a navvy. He admitted that the work was "strenuous;" but a little of the toil would not, he said, do him any harm, and he felt hardly any the worse for it. The Mayor of Glebe (Alderman Artlett) said he thought his brother Aldermen should take shifts in the retort-house; and he expressed his intention of doing a turn.

The position at North Sydney was quiet throughout the whole of the 6th of March; work proceeding as satisfactorily as could be expected with the amateur staff engaged. The supply of gas appeared to be adequate for ordinary purposes. The street-lamps were again alight in the evening, though there had been some difficulty in getting this part of the work done. At Manly, a full supply of gas was available. At the City works of the Australian Gas Company, the large holder was full, and a portion of the gas produced was being sent to replenish the other holders. There were plenty of volunteers; and fresh offers continued to be received. The men were fed and lodged on the works, and appeared to be satisfied with their new duties. At Mortlake, apart from the trouble already referred to, things were very quiet. There were about 150 men working; and the gasholder was gradually rising. Seeing this, many of the strikers began to feel they had been beaten.

Conclusion of Peace.

In response to the invitation of the Premier, a conference was held in his room in the afternoon of the 7th of March. It was attended by representatives of the Gas Companies and their employees, and extended over four hours. It was understood that both sides had full power to bring about a settlement of the existing trouble; and though the conference took place in strict privacy, there were signs that agreement was not being arrived at easily. At the conclusion of the proceedings, the Premier announced to the representatives of the Press that the conference had been successful. An agreement had been arrived at by mutual consent, and the strike was settled. He added: "The men go back to work at Kent Street [city works], Mortlake, and Manly, at two o'clock, and at North Sydney at one o'clock to-morrow. The lamplighters will return to work on Sunday night, the gas-fitters and their assistants at 7.30 to-morrow morning, and the outdoor workers on Monday morning." The Premier was asked upon what terms the men were returning. He replied that they would not be announced until the next day.

Terms of the Settlement.

On the morning of the 8th of March, a mass meeting of the employees was held, at which the terms of settlement drawn up at the conference held the preceding day were submitted to them and accepted. They were signed by the Premier, on behalf of the Government, by Mr. P. T. Taylor, for the Australian and North Shore Gas Companies, and by Mr. S. Rawlin, the Secretary of the Employees' Union, and were as follows:—

1.—That the men shall immediately resume work; that the Government will summon a special session of Parliament within twelve days to procure an amendment of the Industrial Arbitration Act, 1912, to permit of the matter in dispute being dealt with by a Board; that the Companies shall agree to give retrospective effect to the date of resumption of work to any provision for excess rates contained in the award to be made by such Board; and that any increase in the gas-rate which may result from the award mentioned shall be allowed to operate for a sufficient period to enable the Companies to recover the amount expended by them under the provision for the retrospective effect of such award.

2.—That the men shall return to work forthwith, and each man shall be restored to his former place and position.

3.—That there shall be no victimization by the Companies of the men on strike, nor by the men or Union of any of the men employed by the Companies.

4.—That the Judge will be requested, immediately power has been obtained, to determine the question of wages, and to deliver his award within fourteen days.

The men resumed work in the afternoon; and in a short time events were rapidly moving towards the delivery of a normal output of gas into the holders.

Effects of the Strike.

It is unnecessary to reproduce the details furnished by the papers to hand of the serious inconveniences and loss caused by the strike. The suburbs depending upon gas as an illuminant were plunged into darkness; the hospitals were hampered in their work; the Sunday evening services at many of the suburban churches were conducted in the open air; and the cooking of meals in thousands of homes was carried on under manifest disadvantages. An approximate idea of the loss to the Gas Companies may be obtained from the fact that the daily output ordinarily amounts to about 12 million cubic feet in the case of the Australian Company at that period of the year. From the 1st to the 5th of March, 72 million cubic feet would have been supplied to the public but for the strike. At the present price of gas (3s. 6d. per 1000 cubic feet) this would have come to £12,600. From this sum, however, there would, of course, have to be deducted wages and other charges. With regard to the men, calculating on the basis of the statement of the average wages rates of members of the Employees' Union, supplied to the Press by the Secretary, it has been estimated that the loss of money suffered during the strike was approximately £6300. The number of men enumerated was upwards of 1900, and the total daily earnings given for these was about £813.

Comments on the Strike.

Referring to the conclusion of the strike, the "Melbourne Age" said: "The men, after penalizing the whole city for nearly a week, have gone back to work on terms almost the same as those which they rejected at the first. They have bullied the State Ministers, abused the city government, committed outrages on decent citizens who flew to the rescue of the State, and have generally played the part of rebels in a free and orderly community. They have set an example of bad and disorderly citizenship, and have struck a blow at the integrity of democratic government. The trouble for the time being is over; but that is a small thing as compared with the illimitable harm which a strike of this nature may do. It is the proclamation of a right of any section of a people to set up civil war on society, to disrupt the orderly functions of government, and to inflict great losses on inoffensive people. Can society hold together for any length of time on such terms as these? It may confidently be asserted that such a thing is impossible."

Interviewed on the subject of the new position in regard to the gas dispute, Sir Joseph Carruthers made the following remarks: "Like everyone else, I am glad that the strike is over, and that the era of darkness has gone. Personally, I think that the gas employees had a good claim to higher wages; but in my opinion there has been created a bigger issue than that of the increase of wages to a deserving body of men. That issue simply is whether it is open to any body of men to flout the laws of the country, to set authority at defiance, to deprive the innocent public of a necessity of life, and then, forsooth, to go back to work only when a Ministry and a Parliament go on their bended knees to ask them so to do, with guarantees of victory to them. If this state of affairs is to be applauded in this country, then the future looms full of serious trouble. . . . The gas men have gained a victory at the price of reducing our much-vaunted system of democratic government to a farce—substituting therefor the power of organized unionism, which scorns arbitration, wages boards, conciliation, and all other devices of the law, when and how it pleases, and sets up in their place a state of terrorism. It is a big price to pay for even justice to a body of hard-working men, who to-morrow, individually and collectively, may have occasion to appeal to the law and to constituted authority to protect them if anyone tries to rob them of any of their rights as citizens. . . . Personally, I consider that the whole business regarding the Gas Companies has been blundered from end to end. The Gas Bill was the beginning of the mess; and then, when the Gas Companies got some justice by the help of their employees, who stood loyally by them, we find that the Directors increased their fees, the shareholders divided-up the accumulated profits of years, the office-staff got increases, and the men were left out of consideration. A little common sense and tact would surely have averted the recent trouble. Nevertheless, though I sympathize with the men, I put the public interest and the respect for the laws and constitution of the country on a higher plane than a mere question of an extra shilling a day to any set of men. The gas men could have got that increase without defying the public and its laws."

Smart Sentence for Gas-Meter Theft.—A sentence of three months' imprisonment was imposed on Henry Clarke, at the Northern Police Court, Dublin, on conviction for breaking open a gas-meter in a house by means of a poker, and extracting coppers.

Penzance Gas Company.—The annual meeting of this Company was held on Monday last week. The Chairman (Mr. Percy J. Chirgwin) said the past year had been a record one in the history of the Company. The additional quantity of gas sold, compared with the previous year, was 5,286,700 cubic feet. The make and sale of gas per ton of coal were very satisfactory, being 13,187 and 12,246 cubic feet respectively. While the increased make of residuals and the saving in fuel were considerable, the leakage was 6 per cent. The shareholders expressed themselves highly satisfied with the year's results; and a hearty vote of thanks was passed to the Chairman and Directors for their services. The Chairman, on behalf of himself and his colleagues on the Board, thanked the Engineer and Manager (Mr. W. Nicholls) and the other officials most heartily for their services. A dividend at the rate of 6 per cent. was declared.

EXAMINATION IN "GAS SUPPLY."

The City and Guilds of London Question Paper.

In the "JOURNAL" last week, we gave (p. 270) the questions set by Mr. Thomas Glover, of Norwich, the Examiner in the "Gas Engineering" examination held at the City and Guilds of London Institute on the 19th inst. We are now able to give the questions set by Mr. Walter Hole, of Leeds, in the "Gas Supply" examination held last Saturday. As on the previous occasion, the candidates were directed to confine themselves to one grade only, and not more than eight numbered questions were to be attempted in the four hours allowed. The numbers at the ends of the questions are the maximum marks obtainable.

Grade I.

1. (*a*) Figs. 1, 2, and 3 show three different kinds of joints for cast-iron pipes. State how the joints are made and the advantages and disadvantages of each.

or, (*b*) It is proposed to lay 1000 yards of 6-inch cast-iron main. Calculate the saving effected by using pipes 12 feet long as compared with pipes 9 feet long, assuming (1) that it costs 1s. 6d. to make a 6-inch joint, (2) that a 6-inch socket weighs 28 lbs., (3) that the cost of the pipes is £5 7s. 6d. per ton. [32.]

2. Fig. 4. shows a sectional elevation through a piece of apparatus used in gas distribution. What is it? State precisely how it works. [32.]

3. Describe any apparatus you would use for locating an escape of gas in (*a*) a public street and (*b*) a private dwelling. [34.]

4. How many complete revolutions per minute will a 20-light wet-meter drum make when passing its rated quantity of gas; and, assuming that there are four measuring chambers, what will be the cubic capacity of each? [32.]

5. How is a non-luminous flame produced from coal gas? How many volumes of air to one volume of gas are required for the complete combustion of a 15-candle power unmixed (no carburetted water gas

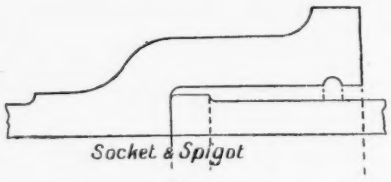


Fig. 1.

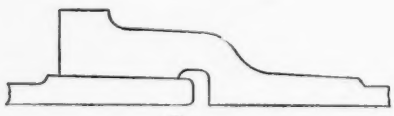


Fig. 2.

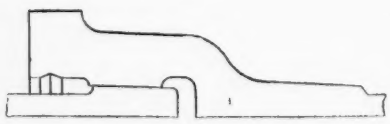


Fig. 3.

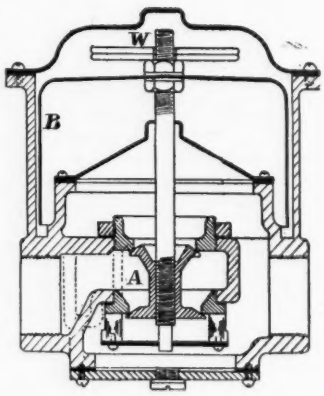


Fig. 4.

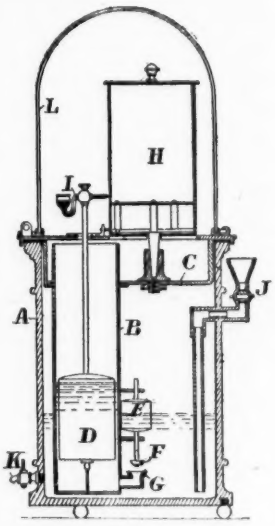


Fig. 5.

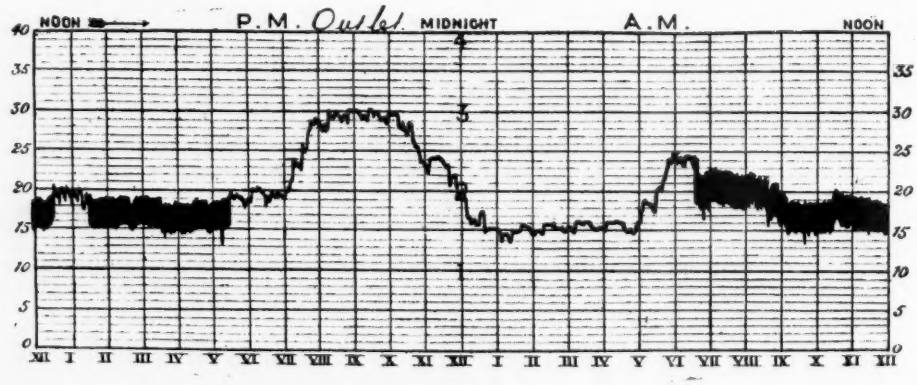


Fig. 6.

coal gas? About what proportion of air is introduced as a primary air supply in an upright "C" burner, and what is the effect of (*a*) an under aëration, (*b*) an over aëration of the flame? [36.]

6. State the advantages and disadvantages of (*a*) the internally heated gas-oven and (*b*) the externally heated gas-oven. If, in using the former, it is found that the lights in the oven are repeatedly extinguished without any apparent reason, what would you suspect was the cause, and how would you deal with it? [38.]

7. Describe the construction, working, and use of the instrument illustrated in fig. 5. (Use the lettering of the diagram for your description.) [42.]

8. If, in attending to a complaint respecting the imperfect working of a gas-engine, you obtained a pressure chart upon the outlet of the gas-engine meter similar to that shown in fig. 6, what would you suspect was at fault, and how would you proceed to remedy it? [42]

9. What may be the causes of a gas-fire emitting an unpleasant odour when in use, and how would you deal with them? [38.]

10. Assume that the gas-pipes which are buried in the walls and floors of a private residence have become stopped with naphthalene. How would you clear them? [38.]

Final Examination.

1. Transpose Dr. Pole's formula—

$$V = 1350\, d^2 \sqrt{\frac{p\, d}{s\, l}}$$

into terms of d. You are required to supply a factory with 3000 cubic feet of gas per hour through a service 100 yards long. The pressure at the inlet of the meter is to be not less than 30-10ths, and the pressure in the main from which the service is to be taken is 32-10ths. Calculate the size of service required. (Specific gravity of the gas = ·4; and $3^5 = 243$, $4^5 = 1024$, $5^5 = 3125$.) [38.]

2. Describe any method of automatically indicating in the governor-house a fall of pressure in the mains below a certain predetermined minimum at any prearranged point in the area of supply. [32.]

3. The bad smells noticed in the basement of a building may be due to the presence of either sewer gas or coal gas. How would you distinguish between the two? What tests would you apply? [34.]

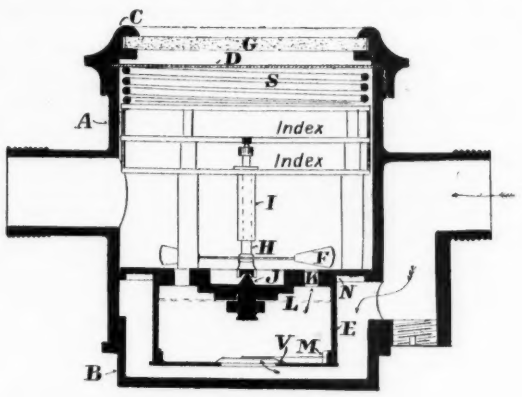
4. Fig. 1 [next page] is a sectional elevation of a well-known "discount meter." State precisely how it works, using the letters of the illustration for the purpose of your description. [32.]

5. A restaurant dining-room is 50 feet long by 30 feet wide by 18 feet high to the plastered ceiling. How would you light such a room with gas? How would you recommend your plan as against a competitive scheme for electric lighting of the same room by metallic filament lamps, assuming the total candle power to be the same in both cases? [42.]

6. State precisely how you would test a radiant gas-fire for hygienic efficiency. [38.]

7. State exactly how you would test a gas-heated water-boiler for thermal efficiency. Assuming that it took 45 cubic feet of gas having a calorific value of 550 B.Th.U. to raise 36 gallons of water from 50° Fahr. to 110° Fahr., what would be the percentage efficiency? [38.]

8. Fig. 2 is a sectional elevation through a high-pressure gas-lamp. Describe the working of the lamp, and state what efficiency, per cubic foot of gas consumed, you would expect to obtain from a lamp of this kind of 1000-candle power. What advantage is gained by the use of the stirrup piece shown at V? [36.]



Discount Meter.

9. With gas at 2s. per 1000 cubic feet, and electricity at 3d. per unit, calculate the cost of gas and electricity respectively of (*a*) 100 high-pressure gas-lamps, (*b*) 100 metallic filament cluster lamps, and (*c*) 100 flame arc lamps, each of the lamps being of 1000-candle power, and running for 1000 hours. (The 100 metallic filament cluster lamps are to be made up of five 200-candle power lamps in each cluster.) [32.]

10. How would you prove the hygienic superiority of gas over electric lighting in a properly ventilated apartment? Sketch and describe any method of gas lighting which is specially designed to assist the ventilation. [42.]

AMERICAN GAS-WORKS DAMAGED BY FLOODS.

The last number to hand of "Gas Age" contains some particulars of the damage done to gas-works by the late disastrous floods in America. Full reports in regard to Ohio, Pennsylvania, and Indiana had not been received; but we give extracts from those appearing in our contemporary.

Cleveland and Cincinnati.

The service of the East Ohio Gas Company was not materially affected. At Youngstown, Niles, Warren, New Philadelphia, Akron, Canal Dover, Massillon, and several other places, trouble was experienced by reason of the overflow, and nearly 3000 of the Company's meters were operated under water. The President of the Company (Mr. Martin B. Daly) stated that the regulators for reducing pressure are placed in vaults under the streets, and the pressure of water above naturally prevented their operation. "It was necessary to have the pressure controlled by men at the valves. This was accomplished by constructing platforms above the valves, and using a long pronged curb key to increase or decrease the pressure in proportion to the demand. Along the main lines, the trouble had been anticipated, and every man who could be secured was placed along the right-of-way with the necessary equipment to make repairs quickly and to prevent the breakage of pipes by earth slides on the hills and mountains in the southern part of the State. We had great difficulty in some of these places in keeping the lines in place during the wet season; but we have to a certain extent overcome this trouble by tiling underneath the pipe-lines on the side hills, thus affording an outlet for the water, and preventing the earth from slipping. Notwithstanding this, in some instances during the floods we had slips covering from 10 to 15 acres of ground. Naturally, we had several breaks; but on account of having made preparation for every emergency our service was not interrupted, except where some local situation affected it. Our good fortune in giving continuous service was due to the faithfulness and loyalty of our men, both in the field and distributing plants; many of them working continuously for nearly 48 hours. Our artificial plant in Cleveland suffered to some extent by reason of the overflow in the flats upon which the coke-oven plants are located. However, the service was not interrupted."

Mr. James C. Ernst, First Vice-President of the Union Gas and Electric Company of Cincinnati, wrote as follows: "We have been able to keep our customers supplied with all the natural gas required, both for private and industrial purposes. We have no interruptions whatever to our pipe-lines leading from Cincinnati to the West Virginia fields, 160 miles, though this line was built through the mountains, crossing the many streams, as well as the Ohio River, which has such an enormous rise. We have had a little trouble in the distribution in Cincinnati in the flooded districts, where our meters were submerged on account of the water rising so fast that we could not take the meters out fast enough, and water entering the mains, cutting out the supply entirely to some of our customers and making a reduced pressure to others. This only included a very small proportion of our business. The public has been agreeably pleased with the fact that we have been able to keep both the electric light and gas supply distributed without any interruptions or inconveniences except as mentioned above."

Terre Haute and Indianapolis.

The General Manager of the Citizens' Gas and Fuel Company of Terre Haute (Mr. A. S. Cooke) reported: "The Company fortunately sustained no great damage. The tornado-swept district was in the extreme southern part of the city, in which district were perhaps about thirty or forty of our customers, a considerable number of whom were deprived of their homes through total destruction by the storm. Our Secretary (Mr. Terhorst), together with his family, was in his home when it was blown from its foundation and partially turned over. Fortunately they escaped without injury, except a slight one to Mrs. Terhorst. The cyclone covered a territory of about 25 blocks from west to east, and about 2½ blocks in width, and in certain sections of this area the buildings of various kinds were absolutely blown to pieces, and the results as shown by the destruction are indescribable. Immediately following the tornado, the river rose rapidly and reached the unprecedented stage of 31 ft. 3 in., flooding Taylorville, a hamlet on the west bank of the river, inundating a considerable portion of West Terre Haute, and causing the city to be completely surrounded by water. The flood caused a shutting-down of the gas plant for about 38 to 40 hours. We were able to run several hours after the fires were extinguished through having a locomotive run on to the Company's switch and hooking-up to our steam lines. But eventually the water overflowed the seal wells, and filled all the works mains that were underground. Everything possible was done to keep the water out of the plant; but it was unavailing. To add to the distress, the electric station was forced to shut down. Taking it all in all, considering what was gone through, we believe ourselves fortunate that no greater damage was sustained; and the people throughout the city were very very good, and expressed their sympathy for us."

The General Manager of the Indianapolis Gas Company (Mr. Carl H. Graf), writing on the 4th inst., said: "So far as I can learn, outside reports as to flood conditions in Indiapolis have been exaggerated. The water rose very rapidly on Tuesday, March 25, and by 1.30 p.m. reached the belts of the blowers for our water-gas apparatus. About 3 p.m. the water got into the main flue of our retort-house, and we were obliged to shut that down. On Wednesday, the 26th, at 2.30 p.m., we had one of our water-gas sets in operation, and the works are now in normal condition. We had the water dammed-off from the buildings at our plant, but found it seeped-up through the floor. We were fortunate in having our gasholder full, and, with the kind assistance of the Citizens' Gas Company, who allowed us to connect with their mains, we were able to keep gas in the mains throughout the entire city, with the exception of the west-end. This section is the portion that was flooded; and, on account of our chief feeder main being carried away when the bridge fell, we were obliged to shut off the gas. Some of our mains in this section were flooded; but we are glad to state that by last Sunday night [March 30] we had gas in nearly every part of the flooded district."

Other Districts.

Mr. W. J. Rose, the General Manager of the Alliance (Ohio) Gas and Power Company, reported that his Company escaped the flood entirely, and in the small cities of Ohio the damage was comparatively slight. The 16-inch main supplying Sandusky broke near Mount Gilead; but the service of the Sandusky Gas and Electric Company was only interrupted two days. Sidney and Hardin were without gas for two days; and Bucyrus, Syracuse, Zanesville, Fostoria, Delaware, Tiffin, and Findlay were without gas for a short time. The Logan Gas Company reported wash-outs at Elyria. The regulator-house of the Marion Gas Company was wrecked. In Pennsylvania, the derrick of the Phillips Gas and Oil Company at Butler was blown down, and the service at Oil City was shut off for several days. In New York, the Troy Gas Company were practically the only sufferers. The Lansingburgh gas-mains were waterlogged for a short time. In West Virginia the damage was slight, and the only trouble caused at Benwood was the damaging of the meters, which had to be replaced. In Indiana, Fort Wayne escaped; but the service had to be shut off in Logansport and Wabash. At the extreme points, such as Brantford (Ont.) and Augusta (Ga.), the damage done was very slight indeed. At the former place, a break in the mains of the Dominion Gas Company caused two small fires.

Rotherham Gas-Works Results.

In his report on the operations of the Rotherham Corporation gas undertaking during the past financial year, the Gas Engineer (Mr. J. S. Naylor) states that the quantity of coal carbonized was 25,600 tons, at a cost of £14,635, or 11s. 5·21d. per ton, as against 24,737 tons the previous year, costing £13,076, or 10s. 6·86d. per ton—being an increase of 863 tons, and £1559 in cost. The gas made per ton of coal carbonized was 12,712 cubic feet, as against 12,717 cubic feet. The quantity of gas sold was 285,888,000 cubic feet, as against 282,302,000 cubic feet; an increase of 3,586,000 cubic feet, or 1·25 per cent. The prices of residuals had been higher; and they realized £2768 more than in the preceding year. The amount of gross profit made was £16,289, as against £16,109, an increase of £180. This is in spite of the £1559 paid extra for coal during the year, and an increased assessment which involved £1000 more for the rates. The net profit, after allowing for interest, redemption instalments, and contributions to sinking fund, amounts to £6694, as against £6635.

Lamps Attached to Buildings.—At a meeting of the Holborn Borough Council last Wednesday, the Works and General Purposes Committee reported that a letter had been received from the Clerk of the London County Council asking that the Borough Council should allow one of their officers to give evidence before a Select Committee of the House of Commons in support of clause 25 of the County Council's General Powers Bill, by which authority is sought for borough councils to attach to the external wall of a building any brackets, wires, pipes, lamps, and apparatus for lighting the streets. The Committee were of opinion that this would be a very useful power for the councils to possess, having regard to possible changes in the methods of public lighting. They mentioned that, out of a total number of 1845 lamps in the borough, 367 are bracket lamps attached to buildings, and that the council have in each case to obtain the consent of the owner of the premises to which they are attached; and occasionally difficulty has been experienced in obtaining this consent. Provided that the power is given only to the borough councils, they thought it desirable that the application should be supported before the Parliamentary Committee.

OPPOSITION TO IRISH ELECTRIC LIGHT ORDERS.

To-day we report briefly the concluding proceedings in connection with the applications for Electric Lighting Orders by the Local Authorities of Banbridge and Dromore, which were in each case opposed by the Gas Companies in these towns.

Banbridge.

Mr. *J. U. Finney* said, as the result of inquiries he had made, he had come to the conclusion that an electric light scheme in Banbridge would not pay. He understood that it was proposed to light the town with 25-candle and a few 50-candle lamps. For the purpose of comparison, he put up a 25-candle light outside his own premises, and he could really see no difference between it and the ordinary gas-lamps. He opposed the scheme on the ground that any loss incurred would fall upon the ratepayers in the end.

Mr. *S. Dickson* said his business premises were lighted by gas, and since the new manager of the works came the supply had been very satisfactory. The electric light would have to be very much cheaper than gas if he took it. It was a question whether a hundred people would take the light.

Mr. *G. F. Power* stated that, so far as he knew, there was no demand for the electric lighting scheme; it would be a luxury altogether. He always found the Gas Company willing to comply with requests made to them by the Council, and they laid new mains at their request at considerable expense on several occasions. Complaints as to the town lamps were mostly in regard to irregularities in lighting them. He did not think the Company were to blame in this respect. He was of opinion that if they had incandescent burners in the street-lamps it would be better than 25-candle power electric lamps. Assuming that the scheme went through, he would not take the electric light unless it was very cheap. He was quite satisfied with the light he had.

Other witnesses having been called,

Mr. *M'Neight* (the Secretary) and Mr. *Mearns* (the Manager) of the Gas Company were re-examined on points left over, and this concluded the evidence.

The Inspector (Mr. G. B. Deane) was then addressed by Counsel for the opponents and promoters respectively, and the inquiry closed.

Dromore.

The report of the proceedings in this application which appeared last week closed with the statement that Mr. Pegg, who had prepared the electric lighting scheme, was being examined upon it when the inquiry was adjourned. On its resumption,

Mr. *Pegg*, continuing his evidence, said his experience was that 6 units of electricity, at 6d. per unit, were equal to 1000 cubic feet of gas, and therefore 3s. worth of electric light was worth 5s. 3d., the price of gas per 1000 cubic feet in Dromore—the ratio being 4s. to 7s. Witness admitted that an electric lighting scheme had failed at Ballyclare (Antrim), and that no scheme had yet been promoted in any of the smaller Irish towns indicated during the inquiry, except Dundalk. The profits of the Dromore scheme showed 15 per cent.; but the highest percentage of profit on a scheme in actual operation was in Worksop. It was 14·07 per cent. There were 1100 schemes in operation, but only 300 published figures.

Mr. *T. E. Pye*, called on behalf of the Gas Company, said he did not believe the scheme would pay, but, on the contrary, would be a burden upon the rates. In support of this opinion, he submitted, as in the Banbridge inquiry, a number of statistics from various sources, and the series of diagrams referred to last week (p. 271). It appeared from these that the promoters' estimate of capital amounted to 27s. per head of the population, as compared with the average of twenty scheduled undertakings of £3 7s.; an estimated surplus of 6s. 6d. per £1 of gross revenue (a deficit of 1½d. being the average experience); and, per head of the population, a surplus of 2s. 2d., compared with the precedent of a deficit of 8d. The other particulars submitted disclosed similar divergencies between the promoters' estimates and actual recorded experience. Witness also dealt with the statements made by Mr. Pegg as to the relative values of gas and electricity, on the basis of 16 candles per cubic foot for gas and 0·8 candle per watt for electricity. This at Dromore would put the cost of gas lighting (at 5s. 3d. per 1000 cubic feet) at about one-half that of electricity (at 6d. per unit). Witness also gave evidence as to the large number of public authorities (London and Provincial) who have given up electricity for public street lighting in favour of gas, and submitted further evidence on the lines of that given at the Banbridge inquiry. He gave the relative numbers of electric and gas lamps used in the public lighting of many of the principal towns of the United Kingdom and on the Continent. Statistics were also put in to indicate the relative risks of fire attendant upon the use of electricity and gas respectively, as indicated by the London County Council's Fire Brigade returns. Mr. Pye strongly opposed the claims of the promoters for superior hygienic conditions; quoting, in support of his views, extracts from "Public Health," the "Journal of the Sanitary Institute," and other hygienic and educational publications.

Mr. *A. M'Ivor Cleland*, Outdoor Superintendent to the Belfast Gas Department, gave some very interesting evidence based on his experience in the city. He showed that electricity is not cheaper than gas. Electric lighting, in his experience, was only used in high-class houses and shops. Gas used with incandescent burners would give three times as much light as electricity for the same price. He considered the promoters' statements as to the relative values of gas and electric lighting to be seriously misleading; and as to the estimated revenue, in Dromore, where there were only some 400 to 500 houses, the output of electricity could not be expected to nearly equal the Council's estimate. To secure this, it would be necessary for 100 houses to be using more than eighteen 30-watt lamps for the full season of 500 hours. Witness considered that suction-gas engines, as proposed for Dromore, would not work economically under much less than a three-quarter load; the gas varied greatly, and the wear and tear was excessive. As regards the possibilities of heating business, witness pointed out that whereas the total heating efficiency of a unit of electricity is 3400 B.Th.U., a cubic foot of Dromore gas will develop 600 units; so that 5·66 cubic feet of gas, costing 0·356d., would develop as much heat as a unit of electricity costing 6d.—proving electric heating to be 16·8 times as costly as gas heating at Dromore. Witness dealt with the detrimental effect on the eye of the metallic electric filament; also on the advantage, for hygienic reasons, of the gas flame, as an effective sterilizer, and as a centre of air circulation and an important factor in efficient ventilation.

Mr. *George Castles*, J.P., Chairman of the Urban District Council, said in his experience the gas was very bad, and the lighting irregular. He thought the electric light scheme could be run at a profit.

Mr. *John Mulligan*, the Chairman of the Gas Company, said in his opinion it would be an impossibility to get fifty people to take electric light, and he believed the scheme would prove a disastrous failure. The total revenue from gas last year, inclusive of street lighting and heating, at 5s. 3d. per 1000 cubic feet, amounted to £900. On the assumption that gas at 5s. 3d. was equal to electricity at 3s. for 6 units, the £900 would be reduced in proportion, and would produce £514 9s. 8d. The Gas Company had 180 consumers, and if the electric lighting scheme took away 140, as estimated by Mr. Pegg, the revenue would not be £830 or £514 5s. 8d., but £399 19s. 8d.

Mr. *Samuel Moore*, the Manager and Secretary of the Company, and other witnesses, having given evidence,

Mr. *Jacques Abady* was called, and gave details of the number of gas consumers in the United Kingdom; showing that the use of gas had largely increased for private and public lighting, and that by far the greater proportion of the people were gas consumers. The percentage was 1 to 5, which was explained by the fact that small householders could not afford electricity. He had inspected the gas-works at Dromore, and found them well equipped and suitable for all the demands of the town. The public lamps (which belonged to the District Council) were antiquated, and flat-flame burners were used; but if incandescent burners were substituted, a better and cheaper light could be obtained than from electricity. Witness criticized the electric lighting scheme, estimating the revenue from lighting in Dromore at £345—just half Mr. Pegg's figures. The annual cost would be £849 10s.; and, allowing £345 for private lighting, £185 for street lighting, and £50 for power, he saw no possibility of getting a greater revenue than £580.

Other witnesses having been called to show that there was no real demand for the proposed scheme, Counsel addressed the Inspector, and the inquiry closed.

GAS COMPANIES AND THEIR RESIDUAL PRODUCTS.

The Action of the London Chamber of Commerce.

At the Annual Meeting of the London Chamber of Commerce last Thursday, the report presented contained an account of the proceedings at upwards of four hundred meetings held in the period under review; but the only matter of special interest to the gas industry was that dealt with by the Chemical Trade Section—viz., the purchase and sale of their residual products by gas companies. In this report, the proceedings already recorded in the "JOURNAL" were reviewed, and the result of the action on the Bill of the Wandsworth Gas Company and other Gas Bills set forth. The Association of Tar Distillers joined in the opposition and promised to contribute towards the expenses. Protracted negotiations took place with reference to the amendment of the measure, with the eventual result that, when the Bill passed through Committee, the following new clause had been inserted in lieu of the one originally proposed: "The Company shall be established for the purpose of manufacturing, storing, and supplying gas for lighting, heating, motive power, and other purposes within the limits of supply, as defined by this Act, and may convert, manufacture, and sell all residual products resulting from the manufacture of gas by them, and generally may carry on any business usually carried on by gas companies; but the Company shall not purchase for use in any process of manufacture any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products or for the construction, maintenance, and repair of gas-fittings." The report said the action taken by the Chamber and the Coal Tar Distillers and other bodies was, therefore, on the whole, successful, "and should form a useful precedent for opposing any similar proposals which may be inserted in the Bills of future gas undertakings from time to time." The report next dealt with the proceedings before the Joint Committee, some of whose recommendations (Nos. 8 to 13) were given. No allusion was made at the meeting to any of these matters; and the report was adopted.

Newry Water Supply.—The Newry Urban Council have resolved to carry out recommendations by Dr. W. J. Wilson, of Queen's University, Belfast, for the improvement of the water supply, including storage and the introduction of a scheme of sand filtration; while a request has been made that the Trustees of Camlough Lake, from which the supply is taken, should meet the Council on questions raised in a report by Mr. Swiney, the Trustees' Engineer.

Metropolitan Water Board's Deficiency.—In connection with the clause which the Metropolitan Water Board propose to add to their Bill to legalize the raising by precept of the money required to meet the accumulated financial deficiency, the Finance Committee of the Lambeth Borough Council have pointed out to the Board that considerable financial inconvenience would arise if the contributing authorities were required to liquidate the accumulated deficiency in the water fund during a single half year, and that it was desirable that the Board should add such words to the clause as might be necessary to provide specifically that the accumulated deficiency might be payable in two instalments—viz., on Oct. 31, 1913, and April 30, 1914—so as to throw the amount into two financial years. It is stated that this suggestion has been adopted, and that the clause may now be expected to receive the support of the Metropolitan Borough Councils.

SINGAPORE GAS SUPPLY LAST YEAR.

Report of the Acting Gas Engineer.

We have received the report of the Acting Gas Engineer to the Municipal Commissioners of Singapore (Mr. Arthur M. Thompson) on the working of the gas undertaking in the year ended Dec. 31 last. It furnishes the following particulars.

The quantity of gas manufactured was 129,837,100 cubic feet, compared with 106,884,300 cubic feet in 1911; being an increase of upwards of 22 million cubic feet, or at the rate of 21 per cent. For the public lighting, 43,057,800 cubic feet were used, or 33·1 per cent. of the output. In 1911, the quantity was 41,848,953 cubic feet, or 39 per cent. of the output. For private lighting, the consumption was 77,652,600 cubic feet, or 59·9 per cent. of the gas sent out; being an increase of 27·7 per cent. The gas sold to private consumers in 1911 was 60,775,000 cubic feet, or 56·8 per cent. of the output. At the close of the year, there were 786 additional consumers on the books.

Mr. Thompson says the continued popularity of gas for private consumption is most gratifying; but it severely taxes the resources of the existing plant. High-pressure plant has, however, been completed and other improvements effected. A contract for new carbonizing plant on the intermittent vertical retort system has been entered into with Messrs. Robert Dempster and Sons, of Elland; and another for condensers has been placed with Messrs. Clayton, Son, and Co., Limited, of Leeds. The last-named firm put in a new 12-inch and a new 15-inch governor during the year; and Mr. Thompson says "the whole of the installation was a credit to the Contractors and their representative, Mr. J. F. Thomson." All four gasholders were in constant use during the year. There was some trouble with the spiral-guided one, owing to the foundation settling. Great difficulty was experienced in dealing with it; but eventually, after some anxious weeks, Mr. Thompson succeeded in stopping the unequal settling. The gasholder now being constructed by Messrs. Clayton will have a capacity of 600,000 cubic feet, compared with 184,000 cubic feet, the capacity of the present largest holder.

Naphthalene was a serious cause of trouble. During the early part of the year, as many as forty or fifty complaints per day were received of stoppages, particularly in the public lamps, due to the inefficient working of the condensers. Washing the gas in kerosene, and spraying benzine vapour into it, was tried, but with only partial success. A patent vaporizer, made by Messrs. Robert Dempster and Sons, was eventually installed, and Mr. Thompson says it has proved most effective; the complaints now being practically confined to public lamps in exposed positions.

The quantity of coal carbonized was 10,024 tons, and the make of gas per ton was 12,952 cubic feet, of which 12,187 cubic feet were sold. The gas unaccounted for was 5·8 per cwt. of the make. The residuals produced were: Coke, 5942 tons; tar, 119,213 gallons; the make per ton being respectively 11·85 cwt. and 11·89 gallons.

No particulars are given in regard to the profit made last year, as the figures were not available at the time the report was prepared. Mr. Thompson, however, gives those for 1911, and says that, with the large increase in private sales of gas in 1912, there is every reason to suppose they will be higher than their predecessors. These were: Gross profit, $145,496; interest on loan and sinking fund, $27,224; depreciation charges, $16,403; net profit, $101,869.

As the gas-works have been under the control of the Municipal Commissioners for ten years, Mr. Thompson gives a comparative statement of the principal figures showing the remarkable growth of the undertaking. The following are extracted:

	1902.	1912.
Gas made . . cub. ft.	44,659,000 = 55 p. ct.	129,837,100 = 33·1 p. ct.
Public lighting ,,	24,619,875 = 30 ,,	43,057,800 = 59·9 ,,
Private ,, ,,	13,339,558 = 13 ,,	77,652,600 = 5 8 ,,
Unaccounted for ,,	5,852,367	7,719,500
Coal carbonized . tons	4,127*	10,024
Gas made p. ton, cub. ft.	10,820	12,952
Gas sold ,, ,,	9,400	12,187
Gas made per mouthpiece. . . cub. ft.	4,068	5,846
Coke made . . tons	2,468	5,943
,, ,, per ton, cwt.	11·96	11·85
Tar ,, . . galls.	42,288	119,213
,, ,, per ton ,,	10·2	11·89
Private consumers . .	410	3,331
Public lamps	1,213	2,306
Net profit	$610 (14 months)	$101,869 (for 1911)

* Including 24 tons of cannel.

ANGLO-ROMANO GAS COMPANY, LIMITED.

In the report presented by the Directors of this Company at the last general meeting, they stated that, after the conclusion of the contract with the Municipality, they obtained from Terni sufficient electric power to meet all demands. All the operations for the completion of the works, lines, and distribution plant in the city, as regards both electricity and gas, were carried on actively with appliances of the best type. For next winter, there will be an available supply of gas amounting to 17,000 cubic metres (600,000 cubic feet) per 24 hours. The working results last year showed a decrease in leakage and an increase in the number of consumers, thanks to the continual endeavours of the Directors to popularize gas. The extension of the city boundaries also contributed considerably to this result, as it necessarily involved the laying of mains for the supply of the suburban districts. There was a remarkable increase in the consumption of gas for heating purposes. While this is a great benefit to the public, it causes some anxiety to the Directors, owing to the rise in the price of coal, which was as high as 43·77 lire (34s. 6d.) per ton. The greater use of heating appliances contributed to a larger consumption of coke. The good results obtained were also ascribable to systematic advertising and the exhibition of the latest types of apparatus. With regard to electricity, the works at S. Paolo are completed, and some cables have been laid for the supply of manufacturers in small centres, and especially for tramways and railways. The year's profits amounted to 4,143,038 lire (£165,721), of which 207,151 lire (£8286) go to the reserve. After making all the usual deductions, a dividend of 60 lire (47s. 6d.) per share was paid. No change was made in the Directorate.

DONCASTER GAS-WORKS EXTENSIONS.

During the coming summer months, it is announced in the local "Gazette," a sum of over £7000 is to be spent in so extending the plant and buildings at the Doncaster Gas-Works as to augment their gas-producing capabilities. The constantly increasing output of gas calls for an active policy in the matter of extensions and improvements; and for carrying into effect such a policy, the Engineer and Manager (Mr. Robert Watson) is the "right man in the right place."

Early last year, we are told by our contemporary, the Gas Committee considered the situation, and prepared a scheme designed to increase the possible output of the works from its present figure—about 1¼ million cubic feet per day—to just over 2¼ millions. This scheme was submitted to the Local Government Board, and an inquiry held in March of last year. The first instalment was put in hand last summer, including the construction of a new holder and the provision of new washing and scrubbing plant, capable of dealing with over 2 million cubic feet per day. The work carried out last year, while it was by way of preparation for an increased output, did not of itself have any effect in this direction, except in so far as the additional holder, by providing further storage room, enabled the retorts to be employed up to a fuller capacity than was possible before. The work which is to be done this year, however, will directly increase the output, by enlarging the retort installation itself.

First of all, the coke-elevator is to be removed from its present position at the end of the large retort-house, and the building is to be extended. The work is to be carried out by Messrs S. Beastall and Son, at an estimated cost of £4100. The enlarged retort-house will find room for seven additional beds of retorts, in continuation of those at present in use. Each of these seven beds will contain eight retorts; the new ones having a capacity about 15 per cent. greater than the old ones. The present system of horizontal retorts is to be adhered to. For the present, only three of the seven beds will be fitted up for use—the others being built, and taken into service as required. The contract for the retort-bench and iron work connected therewith has been entrusted to Messrs. Drakes Limited, of Halifax, who have carried out all the previous contracts of a similar kind for the Corporation; and the work will cost £3095. The extension of the retort-house and benches will necessitate an accompanying extension of the coke-conveyors. Additional coal-conveyors will also be provided, along with an extra twin coal-hopper carrying 40 to 50 tons of coal. When the extension of the building is complete, the present coke-elevator will be re-erected at the end. The scheme also provides for the extension of the coal-stores on either side of the retort-house, and the erection of an additional chimney at the end of the extended building. Two large new purifiers are also to be provided this year; and the two boilers at present in use are to be increased to three—the addition being a Lancashire boiler 30 feet by 8 feet.

NELSON CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Nelson Corporation (Mr. A. Morton Fyffe) has presented to the Gas Committee his third annual report, covering the twelve months ended the 31st of March. It furnishes the following particulars.

The expenditure on revenue account during the year was £57,273, or £3781 more than the estimate; while the income was £66,164, or £5524 more. The result is a gross profit of £21,885 and a net profit of £8891, which is £1743 in excess of the amount estimated. The net profit is £21 6s. per million cubic feet of gas. The gross income from gas sales, exclusive of the public lamps, was £43,045.

During the year, 32,544 tons of coal were carbonized—15,380 tons at Nelson works, and 17,164 tons at Brierfield. The total cost of coal delivered at the works was £21,729 19s. 2d., which gives an average cost of 13s. 4d. per ton, compared with 11s. 5¾d. before. The gross income from residuals and bye-products was £15,456. After deducting all expenses of manufacture and handling, the net income was £13,753, which gives a return of 8s. 5¾d. per ton of coal; making the net cost of coal 4s. 10½d. per ton delivered at the works, as compared with 3s. 8d. in the year 1911-12. In the manufacture of carburetted water gas, 93,480 gallons of oil were used, the cost being £1195 11s. 9d.; and 540 tons of coke were employed in this connection. The total make of gas was 417,497,000 cubic feet, of which 35,622,000 cubic feet were water gas. The quantity of gas sold was 417,764,000 cubic feet; being an increase of 41,969,000 cubic feet, or 11·16 per cent., on the sale in the preceding year. The use of gas for power purposes increased greatly during the year as the result of the reduced charges; the consumption being 25,936,900 cubic feet. There are now 66 gas-engines in use; and, additional thereto, there are 37 consumers using gas at the cheap rate for industrial purposes. There are 14,293 consumers on the books—6454 by ordinary meters, and 7839 by those on the prepayment principle. The average consumption by the former was 34,798 cubic feet; by the latter, 17,561 cubic feet.

During the year, 219 gas cookers, boilers, fires, &c., were sold for cash, while 344 appliances were sold on the three-years hire-purchase system. There are now 4032 small breakfast grillers in use, for which no rent is charged, as compared with 4121 before. The Stove Department dealt with 3619 appliances during the year.

The capital expenditure during the past year amounted to £22,251,

consisting of £18,715 for works, £1763 for mains, £1773 for meters. The gross capital outlay on the undertaking is given as £230,121; and the net outlay as £121,386.

In the course of some general remarks on the year's working, Mr. Fyffe says the period was one of unprecedented activity for the Gas Department, owing to the installation of new carbonizing plant and a large increase in the consumption of gas. The latter was due to two distinct causes—the reduction in price to power consumers, which gave an unusual impetus to the use of gas for industrial purposes; and the increase in consumption during January, accounted for by the fact that in the corresponding month of 1912 the cotton-mills were closed. The net cost of coal, after allowing for the extra quantity required, was £3000 more than in the year 1911-12, and £1300 more than was estimated. For the coming year it will cost £4000 more than for the one just closed; making an increase of upwards of £7000 in two years. Mr. Fyffe points out that nominally the increase is due to the recent coal strike and resultant legislation; but it cannot, he says, be pretended that the prices now charged are other than artificial. The cost of oil for gas-making purposes has risen in little more than a year from 2d. to 5½d. per gallon—a fact which renders the manufacture of carburetted water gas impossible. Mr. Fyffe lays stress upon the value of this method of making gas in cases of emergency, and says that during the coal strike last year the supply could not possibly have been maintained without this plant. Instead of being regarded by some few consumers with suspicion, it ought to be valued as the means which prevented a stoppage of the mills during the coal strike. During the year the employees benefited by the general advance in wages of 5 per cent. granted in the spring of 1912, and are now being paid extra for overtime and for holidays, in accordance with the concessions made two months ago, which also included another rise of 5 per cent. to all stokers. The total cost of these advances in the Gas Department is upwards of £1200 per annum. The system of free maintenance of gas appliances, inaugurated a year ago, has proved a decided success. Gas as a means of providing light, heat, and power has now become extremely economical; and that this is being appreciated is evident from the number of gas appliances now in use. Almost every house in Nelson now includes, and regards as a necessity, a gas-cooker and a gas-heated wash-boiler; but so far as the Corporation's area of gas supply is concerned, Mr. Fyffe says there is still a wide field for the introduction of gas-fires.

The Glover-West Vertical Retort Installation.

Reference has already been made to the new carbonizing plant at the gas-works. It consists of forty Glover-West vertical retorts, with coal and coke handling machinery; and Mr. Fyffe bears the following testimony to its efficient working: "The work of construction was commenced early in 1912; and although difficulty was experienced in securing materials, as a result of the coal strike, everything possible was done by the Contractors to expedite the work, which was completed early in October. The plant was put to work on Oct. 12, 1912, and has since been continually in operation; the formal inauguration and inspection by the Town Council taking place on the 9th of December. In the construction of all parts of the work only the best obtainable materials and workmanship were employed; and the specifications were liberally interpreted by the Contractors, to whom the work is a credit. All that was claimed for the system has been realized; and I have no hesitation in assuring the Gas Committee that the carbonizing plant at the Nelson works is at the present time unsurpassed anywhere. The foregoing statement is justified by the fact that during the six months the plant has been in use it has effected an actual saving of £1072 in labour charges and £450 in coke, &c.—a total of £1522. In addition to the saving as stated, a great advantage has been obtained in an absence of naphthalene from the gas made at the works. Gas made in the old retorts contained 16 grains of naphthalene per 100 cubic feet; while the gas from the vertical retorts is found to contain only 1 grain per 100 cubic feet. The tar from the old retorts contained 4 per cent. of naphthalene, and from the vertical retorts 1·2 per cent.; and the alteration in the constitution of the tar has raised its value 1s. 3d. per ton. The same type of plant is now being erected on a large scale at a great number of gas-works—including Manchester, Liverpool, Newcastle, Darlington, Southport, Oldham, Nottingham, Leicester, Macclesfield, &c.—which shows the opinion it has merited from those competent to judge. The estimated cost of the work was £21,650, while the actual cost has been £21,659 9s. 5d."

Stamford Street-Lighting Contract.

In the course of a report which they presented to a special meeting of the Stamford Town Council last week, the Highways Committee dealt with the contract for street-lighting. They stated that the present contract terminates on June 24; and the Clerk, acting upon instructions, obtained tenders for the lighting of the streets, for a period of three years, from the Stamford Gas Company, the Urban Electric Supply Company, and the Kitson Empire Lighting Company. The Committee, having considered the tenders, recommended the acceptance of that of the Gas Company, on similar terms to those contained in the present contract, except that a clause be inserted reserving power to the Corporation to use any of the lamp-standards or to erect any lamp-standards (in either case not to exceed six in number) for experimental lighting purposes or the trial or testing of any other means of illumination for a period of ten days, upon giving a week's notice to the Company. The Mayor (Mr. R. Bell), in moving the adoption of the report, said the Committee found the estimates proposed by the Kitson and the Urban Electric Supply Companies would be too expensive. He explained that a 5 per cent. rise in the price of the gas lighting during the next three years would be caused by the extra cost of coal and labour. Alderman Bettle said he was sorry they could not have the electric light. He believed the difference between that and gas was only £30 or £35. The report was adopted.

A sum of £10,000 represents last year's profits on the gas undertaking of the Blackburn Corporation. Of this sum, £5000 is to be devoted to the rates, and the balance added to the reserve fund.

GAS PROFITS AND THE RATES AT BIRKENHEAD.

Reviewing the trading concerns of the Corporation in presenting the annual budget to the members of the Birkenhead Town Council, Alderman Deakin said he noticed with satisfaction the welcome contribution from the Gas Committee of £13,000, and this despite the fact that the charges for gas were lowered by 10 per cent. twelve months ago. The relief afforded to the rates by this transfer was very nearly 5d. in the pound. A reflex of the flourishing condition of trade was to be observed in the splendid returns from the sales of gas. Though the price had been reduced, the income from gas-rentals would be between £66,000 and £67,000; and about £43,000 had been received for gas supplied through prepayment meters—the latter being a very substantial sum to have been collected in pennies.

In the discussion which followed, Mr. T. L. Dodds said it seemed to him that the return on gas was inexplicable when they compared it with other places. They only had £13,000 with an expenditure of £400,000, while Warrington received a return of £16,368 towards the relief of the rates on a capital expenditure of £143,981. In other words, the people of Warrington received 11 per cent. on the money invested in their gas undertaking, whereas the inhabitants of Birkenhead only received 3 per cent. In the neighbouring borough of Wallasey, the gas-works made a return of £17,310. There was need, he said, for a severe inquisition into the management of their trading concerns in Birkenhead, because he was confident that with some reform in this direction the finances would be placed on a more satisfactory basis. Alderman Deakin replied that the undertakings referred to were for the most part monopolies, and the Corporation had it in their power to make larger profits simply by raising prices. For them to have done this in Birkenhead would, in his opinion, have been unwise, as the only effect would have been to restrict the use of gas. Mr. Dodds asserted that the charge in Warrington was 2s. 1d. per 1000 cubic feet, against 2s. 3d. in Birkenhead. Alderman Deakin replied that it was not fair to compare the profits of municipal and private concerns without including the interest they were paying on borrowed capital in addition to what was handed over in relief of the rates.

GAS PROFITS IN RELIEF OF RATES AT RHYL.

[From a Local Correspondent.]

Rhyl, which is proud to be known as "Birmingham-by-the-Sea," is a popular resort in North Wales; but it has not in recent years kept pace with its younger rivals as a residential centre. In 1891, with 1329 inhabited houses, the population was 6491. At the end of the next decennial period, the number of inhabited houses had increased to 1691, and the population to 8473. By 1911, the rateable value was £63,047, the population 9005, and the summer population 25,000. It is estimated that the residents now number 10,000.

The gas undertaking, the Manager of which is Mr. Leonard G. Hall, Assoc.M.Inst.C.E., was acquired from a Company by the Local Authority on Jan. 1, 1893; the price paid—£35,000—equalling £1800 per million cubic feet of gas sold. Since that date, loans have been raised amounting to £18,986; making a total capital outlay of £53,986. Of this sum, £24,000 has been repaid—the outstanding debt being less than £30,000; so that the capital debt per million cubic feet of gas sold has been reduced to £526. Although, as indicated, the population of Rhyl has not shown much growth, the sales of gas have made steady progress. For some years all payments for new mains, services, meters, and cookers have been made out of revenue.

When the works were acquired, the make of gas was 20 million cubic feet per annum; whereas it is now 64 millions. The make per ton of coal used last year was 12,461 cubic feet, and the gas sold per ton 11,500 cubic feet; the number of consumers being 2100. The revenue has increased from £6400 to £10,933, the repayments of interest and sinking fund from £1901 to £2909, and the net profits from zero to £3175. The net profits for the past eleven years have aggregated £20,897. The District Council have persistently kept up the price of gas in order to assist the local rate account; but they have now decided to reduce it, though the Chairman of the Gas Committee would like to see a reserve fund created.

THE FATAL EXPLOSION AT HEBBURN-ON-TYNE.

Electrically-generated Gas the Cause.

Further proceedings in the inquest on the bodies of Annie Gray and George Collinson, who were killed by an explosion at No. 1, Lyon Street, Hebburn-on-Tyne, on March 30 [*ante*, pp. 53, 272], took place last Thursday. On the previous occasion, the inquiry was adjourned for an expert examination to be made of the electric cables; and a part of the electric cable which had been removed from the street in front of the wrecked house was now produced. Various parties interested were represented, including the South Shields Gas Company, the Northern Counties Electric Supply Company, the owners of the property, and the District Council. Right up to the last moment, the Electricity Company left no stone unturned, in the hope of finding something to bring in the Gas Company. Not only did they dig trenches in the roads and footpaths in the vicinity of the damaged property, but they secured authority from the Council to expose the gas-mains and bare the joints, and also had Dr. Dunn, the City Analyst of Newcastle-on-Tyne, engaged on the case. Apparently, however, they finally arrived at the conclusion that the evidence against them was so overwhelming as to be practically incontestable, and so (beyond the points brought out in cross-examination of the electrical witnesses) it was unnecessary to bring any evidence at all on behalf of the Gas

Company, though they had present Dr. Thornton (Professor in Electrical Engineering at Armstrong College), Dr. Smythe (Lecturer in Chemistry at Armstrong College), and Mr. Hunt (Lecturer in Electrical Engineering at Armstrong College), all of whom had submitted interesting reports of their investigation, embodying a certain amount of research work on the explosive limits of, and composition of, bitumen gas relatively with coal gas and firedamp, &c.

Among the further evidence called, Mr. William T. Newlands, the agent for the owner of the property, said that after the explosion he saw a "blue flame" burning in front of the house, and passing from the door to the window. He extinguished the flame by putting wet lime upon it. On the same afternoon, a man from the Electric Company was unable to get alight electric lamps near the house. On the following day, at the wrecked house, he detected a smell of burnt india-rubber and of pitch and tar, at the place where he had seen the flame. When the cable was taken out, the smell was stronger.

The next witness was the Surveyor to the Urban District Council (Mr. Henry Paterson), who stated that when the cable produced was raised, it was found to have fused. The trough had been charred, and part of the cable burnt out. He could find no trace of coal gas; and there were no gas-pipes near. The trough was most charred at a point between the window and the doorway. He had heard of several fusings of cables in the streets of Hebburn, especially since March 30. The trenches for the cable were cut near the walls of the houses, or in the street channel.

Evidence was also given by Mr. Walter Bates, who was Engineer to the Northern County Electric Supply Company when the cables were laid in 1902. He thought that when the cables were laid, and before they were completely covered with bitumen, they were strained, so that one lay on top of the other, instead of being side by side. He did not know of an explosion due to electric mains. The crossing of the cable would perhaps have something to do with the fusing.

Mr. Charles Vernier, Mains Engineer of the Newcastle Electric Supply Company, said the electric cable in question had fused for about 6 feet. He explained that the fusing would be greatest at the bend in the cable; and this would set up a tremendous heat, which caused the bitumen to give off a gas. The gas, when mixed with air, would be of an explosive character. It had got underneath the house through the interstices of the walls. It was somewhat difficult to account for the igniting of the gas. It could hardly have been fired directly from the fusing arc, because in that event the explosion would have occurred outside the house also. Possibly the intensely high temperature of the gas had caused the explosive mixture to fire. He agreed that it would have been safer had the cables been laid in the centre of the road, instead of next to the wall, but said that if the same chain of circumstances occurred, there was bound to be an explosion, only it would not be so severe, as the bulk of the gas would have escaped into the air.

The Jury returned a verdict that deceased died "from injuries the result of an accidental explosion of gas generated from bitumen encasing an electric light cable laid in the ground alongside the dwelling-house, No. 1, Lyon Street, Hebburn; and such bitumen had become heated by the fusing of the said cable, and causing the gas so generated to penetrate into and under the floor of the said house."

GAS EXPLOSION NEAR SOUTHWELL.

From its customary quietude, the old minster town of Southwell, which gives its name to the comparatively newly created See, was thrown into a state of unwonted excitement last Thursday by a violent explosion at the Easthorpe Gas-Works of the Company responsible for the district supply. The reverberation occasioned amid the usual somnolent surroundings gave rise for a time to the wildest alarm; and, though subsequent investigation revealed that no injuries of a very grave personal nature had been occasioned, the structural damage entailed was of a serious character. A meter-house was partly demolished, only the main walls remaining standing: the roof being blown clean off, and the windows hurled to a considerable distance. Cottages in the vicinity also suffered through the mishap. The explosion, due to the firing of some escaping gas, under circumstances of a purely accidental character, occurred while one of the employees of the Company, Albert Sceavington, was at work in the building examining the plug of a meter; and his escape from possibly fatal injuries was of an altogether remarkable character. He was in a position of considerable danger, and was unconscious when discovered among the *débris*, but subsequently recovered, having suffered no more serious harm than some severe bruises and the shock necessarily entailed. He was afterwards able to afford some account of the circumstances immediately preceding the accident, which have since formed the subject of investigation by the responsible officials, pointing, it is understood, to a conclusion as to the possible preventable nature of the occurrence, had proper precautions been taken.

The Bourne (Lincolnshire) Gas-Works, established by a Company formed in 1838, are to be acquired by the Urban District Council. The purchase price is stated to be about £12,000.

According to an article in the "Journal du Four Electrique," the use of gas for lighting railway carriages is making steady progress in France. On the old lines of the Western State Railway, there are now 1139 coaches lighted, and 3253 on the lines which have been re-purchased. On the latter lines, 1258 coaches are still to be provided with gas. On Dec. 28, 1911, a Ministerial decree authorized the adoption of incandescent gas-burners for carriages, and the necessary work is to be executed in the workshops at Batignolles, Sotteville, and Rennes On the old lines, 150 carriages are to be provided with incandescent burners to replace the batswings now in use. There will consequently soon be no more oil lighting, except in the trains running on branch lines.

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LEWISHAM INFIRMARY AND WORKHOUSE LIGHTING.

At a Meeting of the Lewisham Board of Guardians on Monday last week—Alderman Jackson presiding—the question of lighting the workhouse and infirmary by electricity again came up, on the report of the Works Committee, in which it was stated that Messrs. Reynolds, whose tenders for the installation at both buildings were accepted at the last meeting [*ante*, p. 118], had withdrawn because of their omission to include the figures for lamps and fittings. By the Board's instruction, the tender of Mr. A. J. Hewens for the installation at the infirmary for £749 had been accepted, and he had been instructed to proceed with the work. Mr. Ross (a new member) called attention to an article that had appeared in a London technical paper criticizing the action of the Board and their expert who prepared the specifications. He wished to know what steps were to be taken in regard to this. Mr. Childs, the Chairman of the Committee, could only reply that they had done their best in the matter. The Chairman remarked that what had appeared in the paper referred to did not influence him. It was not a fair representation of the state of things. He denied that the matter had been "rushed"—having been under consideration for six months. The Guardians felt that they would be effecting a saving by adopting electricity. As to the differences in the amounts of the tenders, anyone who had been accustomed to open tenders knew that the highest tender was frequently 100 per cent. more than the lowest. This part of the Committee's report was then passed.

There was a further paragraph in the report to the effect that, as to the Workhouse installation, Messrs. Weston and Sons had notified that they did not feel justified in taking the work at the price quoted; and in a letter they stated that they had been misled by the specifications. The Committee recommended that the tender of Messrs. Haycroft and Son, Limited, for the workhouse installation should be accepted at £759 10s. Mr. Clemow pointed out that the next lowest tender to that of Messrs. Reynolds was one by Messrs. Tredegar, which was £668. Answering questions, the Chairman said he feared he could not explain why Messrs. Tredegar had been passed over. Mr. Clemow moved, Mr. Ross seconded, and Mr. Weeks supported, an amendment to refer the matter back; and on a division it was carried by a large majority. A notice of motion by Mr. Weeks, to rescind the estimates and specifications respecting the electric light, was declared by the Chairman to be out of order.

TOTTENHAM GAS COMPANY AND ELECTRIC LIGHTING.

At the Meeting of the Wood Green Urban District Council last Wednesday, an important report was submitted by the Clerk (Mr. W. P. Harding) concerning a development bearing on the decision of the Council to transfer their Electric Lighting Order to the Tottenham and Edmonton Gas Company.

The Clerk stated that the North Metropolitan Electric Power Supply Company applied to the Council in the first instance for their consent to the grant of a Provisional Order for which they had applied to the Board of Trade. In view of the agreement with the Gas Company, the Council decided to refuse their consent, and informed the Power Company at the time that if they proceeded with the application it would be strenuously opposed. It, however, went forward. Before deciding, the Board of Trade held an inquiry, at which all parties were represented by Counsel; the Hon. J. D. Fitzgerald, K.C., appearing for the Council, Mr. Vesey Knox, K.C., for the Gas Company, and Mr. Hutchinson, K.C., and Mr. Tyldesley Jones for the Power Company. He (Mr. Harding) had since received a communication from the Board to the effect that they had decided not to proceed further with the application of the Power Company—in other words, not to dispense with the consent of the Council to the Order. The negotiations for a supply of electricity in bulk were fully gone into. Frequent reference was made to the letter to the Board of Trade applying for the final extension of the Order, in which the position of the Council was clearly set out, and in which the Board were informed that there was no hope either of the Council erecting their own generating station or of any terms being arranged with the Power Company for a bulk supply; also to the reply of the Board thereto stating that the Order would be extended so as to enable the Council either to negotiate a transfer of it to a substantial company, or to establish their own undertaking. It was a source of satisfaction to know that the attitude taken up by the Council for the indemnity clause to be inserted in the proposed agreement with the Power Company was fully approved and upheld, and that the somewhat belated indemnity which the Company offered was not sufficient to protect the Council fully against claims which could have been made against them by their consumers, arising from defaults in the supply of energy up to the point of distribution at the Company's boundary.

In the Wood Green neighbourhood, the Board of Trade's refusal to proceed with the Power Company's application has given rise to a doubt as to the Company opposing the Gas Company's Bill.

GAS-FIRES.

[From the "Medical Officer."]

It is, perhaps, hardly surprising that the conservative temperament of the average Englishman should have caused him to cling to the wasteful open coal-fire as a means of warming his dwelling. His attitude towards other methods, such as may be obtained from a system of central heating, is not much altered by a sojourn in those countries where this, or a similar method, is of necessity adopted. He is, however, coming to realize that there is a half-way house between the dirty

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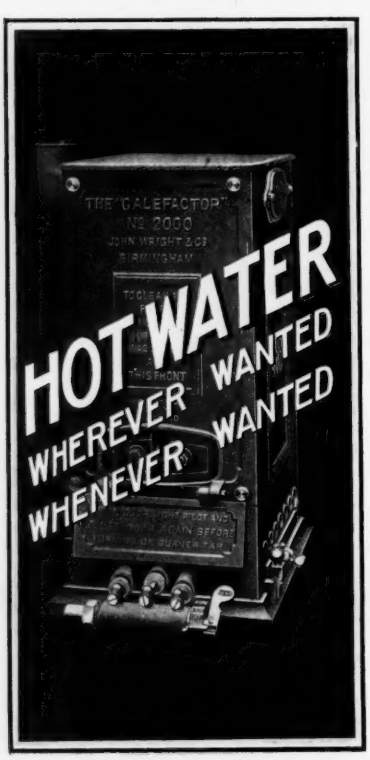

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and wasteful coal-fire and the central heating system, and that it is to be found in the gas-fire, which has the advantage that it is clean, is easily controlled, and can readily be lighted and quite as readily put out. But it must not be forgotten that a coal-fire has the great advantage over all other methods of heating; in that it acts as a very efficient ventilator. The earlier forms of gas-stoves were so deficient in this quality that they could never have become popular. But so great progress has been made in their design, that there should not at the present time be any difficulty in obtaining a gas-stove which should act as an efficient ventilator. We do not forget that the ordinary householder is not as a rule in a position to say whether the gas-stove he particularly fancies is, or is not, a suitable one from a hygienic point of view; and for this very reason he ought to be able to call to his assistance those who are able to advise him. The time, in our opinion, has therefore arrived when these appliances should be controlled by the public health authorities; and just as an untrapped or badly trapped drain is now sought for, and when found is remedied, so should badly constructed and unhealthy gas-stoves be prohibited, so that there should be no risk of any stove being found which would vitiate the atmosphere of a dwelling.

Very special attention has been paid to the seriousness of this question in some parts of Canada, where gas heating in dwellings is quite as prevalent as it is elsewhere. In the City of Winnipeg, there is now a building bye-law in force which provides that all gas-stoves in the city, whether used for cooking or heating, must have ventilating pipes or hoods for the purpose of carrying off the products of combustion and the odours of cooking. These pipes are required to be connected either with ordinary chimneys or to a special flue of cast or galvanized iron, not less than 4 inches in internal diameter, discharging above the roof of the building. If metal flues are to be used, they are to be embedded in brickwork or masonry 4 inches thick, or else encased with asbestos. We believe this bye-law is the outcome of suggestions made by Dr. A. J. Douglas, the Medical Health Officer of Winnipeg; and we congratulate him on the success which has attended his efforts to improve the conditions of living in this particular.

THE OIL FUEL SECURITIES INVESTMENT COMPANY.

Its Connection with Block Tar and Eaton.

In the editorial colums of the last number of the "JOURNAL" attention was called to a circular issued by the Oil Fuel Securities Investment Company, offering shares in the "Parent Company" (which we assumed was the Patent Block Tar, &c., Company, Limited), and suggesting a wonderfully lucrative return. Some remarks on the circular recently appeared in the "Financial News."

The writer of the article first called attention to the fact that the circular bore the name of Captain John Maclean, whose connection with the Eaton group was mentioned by us last week; and he suggested that "Captain Maclean is incurring a very grave responsibility indeed in allowing the use of his name in connection with this Patent Block Tar ramp." In addition to the circular there was a report on the solidified coal-oil process, signed by Mr. J. Greenfield, C.E., who, the writer thinks, "can hardly be aware of the character of the enterprise with which his name is thus publicly associated." Two other documents accompanied the circular—one a slip in red ink, reprinting an extract from the "Daily Mail;" and the other giving portions of a report by Mr. Alfred Henry Lush, barrister-at-law. Each of the documents bore, in minute letters, the name of the Leadenhall Press, Limited, Garden Row, Southwark. This was such strict compliance with the law, that it caused our contemporary to endeavour to find an explanation of it; and the result was the following observations.

"The original Block Tar flim-flam, issued in January, 1910, was decorated with the name of Sir C. B. H. Soame, Bart., Chairman, and promised 150 per cent. dividends. On Oct. 21 of the same year another circular went out, this time promising £2 a share for every £1 share purchased. At that time the Directors of the Block Tar ramp were the 'Bart.' above mentioned and Mr. H. W. L. Way. Both of these gentlemen have been on the directorate of the Water and Gas Debenture and Share Investment Trust, in association with no less a person than Eaton himself, the head of the notorious Eaton group. In January, 1911, Sir C. B. H. Soame, Bart., was harping to a third tune—viz., that the £1 shares of the Block Tar ramp would shortly go to £6. It was at this time that the dodge of inviting the purchaser to deduct his own dividend first made its appearance. A buyer of a £1 share was invited to deduct his dividend in advance; and to send 18s. for the share. In other words, he was to pay himself a 2s. dividend and part with 18s. for a worthless share. As late as June of last year, still another prospectus was in circulation, adorned with the name of Mr. H. W. L. Way, and providing the public with the latest transformation of the original fairy tale—viz., that the £1 shares would shortly be 'unobtainable at £5.' Now, the remarkable feature of all this business is that, so far, it has been conducted by associates of the notorious Eaton. But a month or two ago, Eaton issued a peculiarly impudent circular, attempting to obtain money by flagrantly false pretences. That circular did not relate to the Patent Block Tar affair, but it was of so scandalous a character that Eaton and the printers were promptly prosecuted for issuing it without an imprint—that being a much shorter way of bringing them to book than a prosecution on the [de]merits of the concern itself. Smart fines were inflicted on the offenders by the Magistrate. Now, the printers in question were the Leadenhall Press, Limited; and it strikes us as extremely significant that this latest batch of rubbish in regard to the Patent Block Tar Company, with its scrupulous compliance with the requirements as to the printer's name, and its obvious Eaton associations, should also be printed by the Leadenhall Press. The inference is clear, that the parties who issued this rubbish are very anxious to give no opening for any proceedings against them. That should be sufficient for people who are so foolish as to contemplate a purchase of such stuff."

Gas-Heated Water.

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EAST COWES WATER SUPPLY.

Local Government Board Inquiry.

As briefly recorded in the "JOURNAL" last week, an inquiry has lately been held at East Cowes in connection with an application to the Local Government Board by the Urban District Council for sanction to borrow £986 for an experimental boring in the parish of South Arreton, on a site situated some five and a half miles from the town. The Inspector was Mr. P. M. Crosthwaite, M.Inst.C.E., and, as previously mentioned, the inquiry afforded an opportunity for some considerable local opposition.

The trial boring, for which the specification was prepared by the Surveyor to the Council (Mr. Albert E. Barton), is the first stage in the execution of a scheme recommended by Mr. Percy Griffith, M.Inst.C.E., in a report prepared by him some eighteen months ago. Mr. Barton, in his evidence, explained that the trial boring was to be 16 inches in diameter, and carried to a depth of 400 feet below the surface; and that the estimate included fourteen days' continuous test pumping. Asked by the Inspector whether any provision had been made for driving headings, the Clerk to the Council (Mr. A. Damant) explained that they had not as yet dealt with this matter; and the Surveyor, in reply to the Inspector, stated that the reason for making the trial boring of such large diameter was that, if a sufficient quantity of water were obtained from it, it would serve as a portion of the permanent works, and the extra outlay on a well and headings would be avoided. Tenders had been invited for the work, and one had been accepted, provisionally upon the consent of the Local Government Board being obtained.

Mr. Griffith stated that he should not have recommended so large an outlay on experimental works, as he was doubtful whether sufficient water could be obtained from a boring in the chalk; but that he would have advised a small boring to ascertain the saturation level, and also to enable a sample of the water to be analyzed. He also said it would be very unlikely indeed that any increase in the supply would be obtained by having the boring carried to a depth of more than 200 feet below the surface.

Opposition was offered by two local gentlemen, on the ground that the whole scheme was unnecessarily expensive, and that the capital outlay involved would impose a serious burden upon the rates; but the only alternative suggested was that water might be obtained at the existing works. The Inspector was further furnished with analyses of the present supply, which showed that the quality of the water was anything but satisfactory.

At the close of the inquiry, the Inspector visited the site of the proposed works, accompanied by the Surveyor and Mr. Griffith. It may be mentioned that the estimated cost of the whole scheme was £17,000, though Mr. Griffith had suggested the possibility of restricting the initial outlay to £13,500.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—The Edinburgh and Leith Corporations have been holding an exhibition of gas appliances for domestic purposes, which includes a selection of cookers, grillers, hot-plates, stoves, fires, radiators, wash-boilers, laundry-irons, geysers, and hot-water circulators. On each afternoon and evening, cookery demonstrations and lectures were given by Mrs. H. C. Gray.

Aberdeen.—The Gas Committee had before them the application by the stokers, labourers, gas inspectors, and masons in the employment of the Council for an increase in wages. The matter was remitted to Mr. Milne, the Gas Manager, to report. The question of discounts for gas on weekly payments was discussed; but it was shown that the staff would have to be greatly increased, so that it was ultimately decided not to take any action in the matter.

Berwick-on-Tweed.—Owing to the serious increase in the price of coal and of other material connected with the manufacture and distribution, the price of gas supplied by the Berwick and Tweedmouth Gaslight Company will be advanced next month by 2d. per 1000 cubic feet; making the price 3s. 11d., the same as obtained in 1908.

Bridge of Allan.—The shareholders of the Gas Lighting Company have unanimously agreed to the purchase of their property in terms of the Gas Supply Act of 1876, in consequence of the intimation they had received from the Town Council that they were proposing to purchase, or treat for, the undertaking.

Cowdenbeath.—The Gas Company are at present erecting new purifiers at their works, so that they may cope more effectually with the increased demand for gas. The Town Council held a special meeting on Thursday, at which the Clerk was instructed to inform the Company that the Council had been advised that the charging of the water-rate upon the gross rental of their works was legal, and that, failing a settlement, they were prepared to submit the matter to the arbitration of an advocate in Edinburgh. The Company claim that the assessment should be upon only one-fourth of their rental.

Dundee.—In the course of his evidence in connection with the Dundee Corporation Bill, which has for its object the annexation of Broughty Ferry, Mr. W. R. Herring said that the outlook in regard to the price of gas in Broughty Ferry was satisfactory. The capital charge per 1000 cubic feet was being reduced at a much greater rate than in Dundee. The difference between the price in Dundee and in Broughty Ferry would in future be less marked. In Broughty Ferry the interest-bearing debt had been reduced during the last five years from £39,000 to £30,000; while that of Dundee had increased from £365,000 to £374,000 in the same period. In the same period there had been a reduction in the price of gas in Broughty Ferry from 3s. 4d. to 2s. 8d., against from 2s. 6d. to 2s. 2d. in Dundee. He

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anticipated that in the near future the difference between the price of gas in Broughty Ferry and Dundee would be only 2d. and possibly less. It was probable that Dundee would have an increased capital cost. Within a very few years, the Corporation would have to consider the question of a large expenditure on additional plant. At present the gasholder accommodation was much lower than was usually regarded as necessary. On the present site, there was no land on which to put more holders, and probably, owing to the existing deficiency in storage accommodation, he did not consider the gas supply of Dundee was on so good a basis as was that of Broughty Ferry. In view of the increase in consumption, Dundee would have to provide a new unit, probably within three years; and this would involve a large sum of money. This would be the case whether or not Broughty Ferry were included in Dundee. Including gasholders and mains, he believed Dundee would have to lay out £150,000. Further, in the event of the inclusion of Broughty Ferry, Dundee would lose some of their reserve producing power, and would also have to spend money in laying a high-pressure main to Broughty Ferry. The leakage in Dundee had increased within a comparatively short period from 6 per cent. to 9 per cent. In Broughty Ferry, on the other hand, there had been a reduction in the leakage. He did not think Dundee could go on another winter with their present gasholder capacity. In the event of annexation, a new main would be required from the Dundee Gas-Works to the centre of Broughty Ferry, and plant would have to be put down for forcing the gas along.

Kilwinning.—A new retort-house and meter-house are to be erected by the Gas Company, and the plans for these have been duly passed by the Town Council.

Lanark.—The Gas Committee appointed by the Town Council recommended that power should be given to offer £15,000 to the Directors of the Gas Company for their undertaking. The Council, however, decided to discuss the matter in Committee.

Port Glasgow.—The application of the Town Council for an Electric Lighting Order, in favour of the Greenock Corporation supplying electricity to shipbuilders and other power users, has now been granted by the Board of Trade. This appears to be the first movement towards the combination of the three towns of Greenock, Gourock, and Port Glasgow, which are already united by the electric tramway service, and which could also be served by one gas supply. The towns are continuous; and, in view of the many extension proposals made recently in Scotland, as at Glasgow, Falkirk, and Dundee, it will probably not be long before this question is being brought before a House of Commons Committee.

Rothesay.—The question of vertical retorts has been exercising the minds of the Gas Committee; and a suggestion was made by Bailie J. M'Millan that the present retort-bench, which was quite large enough for the requirements, should be scrapped and new vertical retorts installed, as he considered that a saving of 1700 tons of coal a year might be obtained thereby. Bailie E. R. M'Millan, however, took the opposite view. The recommendation of the Gas Committee—that the Finance Committee should find out on what terms they could obtain £18,000 or £20,000 for a gasholder and such vertical retorts, or a loan of £8000 only for a new holder—was adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 26.

Sulphate of Ammonia.

During the past week there has again been a drooping tendency in the market for this material, and, although the decline has not been rapid, it has been found necessary to accept some reduction in prices in order to effect further sales. At the close, the nearest values are £13 11s. 3d. per ton f.o.b. Hull, £13 12s. 6d. per ton f.o.b. Liverpool, and £13 15s. per ton f.o.b. Leith. For future delivery some producers have now modified their views, and would accept £13 12s. 6d. to £13 15s. per ton at the principal ports for July-December shipment in equal monthly quantities, but consumers decline to operate thereat. It is reported that middlemen are offering abroad over these months on the basis of £13 10s. per ton without meeting with success.

Nitrate of Soda.

The market for this article is rather easier, and the spot quotations have been reduced to 11s. 9d. per cwt. for ordinary quality, and 11s. 10½d. for refined.

LONDON, *April* 28.

Tar Products.

There is little alteration in the markets for tar products, and business is still quiet. Pitch is without change. The inquiry is small, and consumers unwilling to make contracts even at the present prices. In 90 per cent. benzol, there has been increased inquiry during the past week, and better prices have been paid. Solvent naphtha is quiet but steady. There is a little demand for heavy naphtha, which, however, is having no effect on the quotation. Crude carbolic seems steadier, and there has been more inquiry during the last few days; in fact, in some quarters slightly better figures have been bid. No doubt this is due somewhat to the inquiry in the market for crystal carbolic. Creosote is steady; and the price is maintained.

The average values during the week were: Tar, 29s. 9d. to 33s. 9d. Pitch, London, 47s. 6d. to 48s.; east coast, 47s. to 47s. 6d.; west coast, Clyde, 47s. to 47s. 6d.; Manchester, 46s. 6d. to 47s.; Liverpool, 47s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 5½d. to 6d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3½d. to 3⅝d.; North, 3½d. to 3¼d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 5d. to

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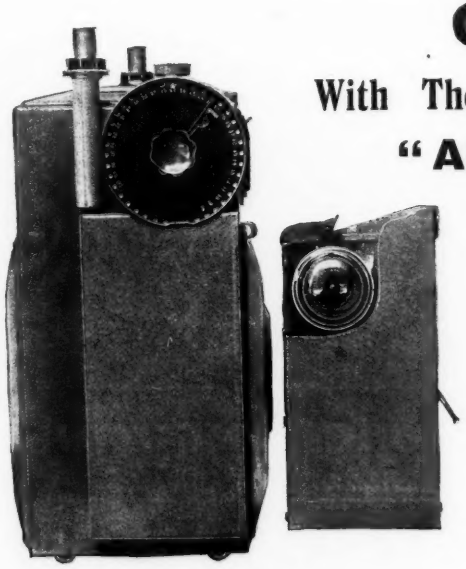

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Sulphate of Ammonia.

This article still shows a further decline, and there appears to be plenty of stuff to meet the demand. Contracts are reported at lower prices, both for delivery over the next few months and to the end of the year. Outside London makes are quoted at £12 17s. 6d.; Leith, £13 15s. to £13 16s. 3d.; Hull, £13 13s. 9d.; Liverpool, £13 15s.; Middlesbrough, £13 13s. 9d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a stronger demand for coal, and the prices are generally firm, while the approach of the holidays must stiffen the market. In the steam coal trade, best Northumbrians are from 16s. 6d. to 16s. 9d. per ton f.o.b., and second-class steams are about 14s. 3d. Steam smalls are steady, and a little more plentiful, at 11s. to 12s. per ton f.o.b. The output is a little better than it was, though it is scarcely normal. In the gas coal trade, the consumption is now naturally lower, but the demand is strong—for stocking purposes at home, and also for export. Best Durham gas coals are from 15s. 7½d. to 15s. 9d. per ton f.o.b.; and the strong demand for this class has driven up second qualities, which are now about 15s. per ton. For "Wear specials," about 15s. 9d. per ton is the f.o.b. quotation. The only contracts of note are for a large Continental company, for some 100,000 tons, delivery over a year from May, and the f.o.b. price is said to be from 13s. 6d. to 14s. per ton, according to the quality. There are some smaller contracts in the market, but these do not much affect the prices. The South Suburban Gas Company and the Ramsgate Corporation are also asking for tenders. Prices forward are generally steady for coals; but where these are for shipment, there is the advantage at present of lower sea-freights to the coasting towns. Gas coke is steady, with a rather fuller export demand.

Scotch Coal Trade.

Firmness of tone and steadiness of prices were the characteristics of the Scotch coal trade during the past week. On the Glasgow Coal Exchange on Friday, the following were the prices quoted: Steam coal, 13s. 6d. to 14s.; splint, 14s. 9d. to 15s. 3d.; ell, 13s. 9d. to 14s. 3d.; trebles and doubles, 13s. 3d. to 13s. 9d.; and singles, 13s. 3d. to 13s. 9d., f.o.b. Glasgow.

Gas-Coal Contracts in the Midlands.

The following remarks from a correspondent appeared in last Tuesday's issue of the "Financial Times": Contracts for gas coals are mostly arranged for periods of twelve months from July 1, and, as a rule, the large gas companies and corporations negotiate their enormous tonnage contracts during May and June. But this year the usual custom has been widely departed from. Generally tenders are advertised for; but a large tonnage has already been fixed up without this procedure, contracts having been renewed with the same collieries as are at present supplying—in many instances the advances obtained being from 1s. 3d. to 1s. 6d. per ton. It will be remembered that last year contracts were readily renewed at advances of 2s. 6d. and 2s. per ton; and it is understood the advances asked this year will be such as will bring prices 3s. 6d. per ton higher than they were on the 1911-12 contracts. It should be pointed out that, while the consumption of gas coals has increased very largely during the last few years (and this in spite of the many installations of oil and water gas plants that have been put into operation), productions have not been materially increased, and consequently collieries can more readily command the advances. At many works a larger proportion of smaller fuels—such as small nuts and gas slacks—are used than formerly; but with the heavy requirements, this does not materially affect the coal position.

Stalybridge Gas Profits and Rate Relief.

Some remarks on the disposal of gas profits were made in the course of a special meeting of the Stalybridge Town Council, which was held for the purpose of considering the estimates of income and expenditure for the ensuing year. At a meeting of the Gas Committee, it had been resolved that a sum of £2000 should be carried from the gas-works revenue account to the credit of the rates. Mr. Bradbury pointed out that they would be giving to the rates about £400 more than they had made in profit on the gas-works. Probably they would be told that they were going to make more profit in the coming year; but he would like to see it made before they gave it away. Alderman Ridyard, on the other hand, argued that they would be quite justified in voting this amount to the rates, and it was in accordance with the Act of Parliament. He believed they would make £2250 profit this year. Various circumstances combined to prevent the sum made the last three years being as big as formerly. Mr. Tonge remarked that some members of the Council were of opinion that, instead of handing money over to the relief of the rates, they ought to reduce the price of gas. In reply to the different speakers, Mr. Cook said the Committee had got the money which was to be voted, and, in addition, they had actually a balance shown on paper of £214. Personally, he was entirely opposed to these subsidies to the rates for undertakings of this character. They should reduce the price of gas. In handing over money in relief of the rates, however, he was merely carrying out the avowed policy of the Council. It would be a sounder method if they could regulate the subsidy to the rates as nearly as possible to one amount, instead of letting it fluctuate from year to year. They were perfectly justified in anticipating larger profits from the gas undertaking.

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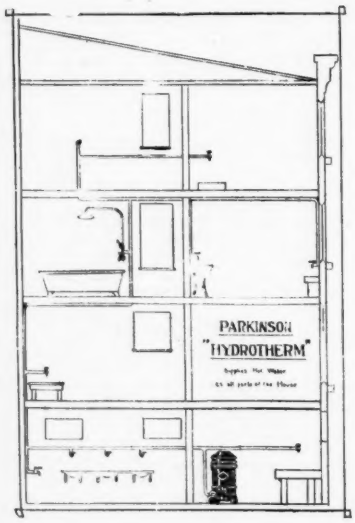

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Cookery Demonstrations at Wakefield.

Gas cookery demonstrations have been held at Wakefield; and Mr. R. Gamble Marks has had large audiences to witness the evidence he provides as to the cooking capacity of a gas-oven. This is the result of one public test: Half leg of mutton (weighing raw 4 lbs. 4 oz.) was cooked. The weight after cooking was 3 lb. 3 oz.; the dripping from same weighed 8 oz. The total weight after cooking was 3 lb. 11 oz., making the loss only 9 oz. (or 2 oz. to the pound). At the same time there were also cooked one dish of potatoes, two apple pies, three large scones, one sponge sandwich, eighteen preserve tarts, and a dish of apples. At the close of the test the oven was absolutely clean and free from grease or smell.

Lighting Back Streets at Burnley.

At the Burnley Town Hall last Saturday, Mr. F. H. Tulloch, M.Inst.C.E., attended on behalf of the Local Government Board to inquire into the application by the Corporation for power to borrow £5000 for the purposes of the gas undertaking. The Town Clerk (Mr. P. Thomas) explained that the Gas Department wanted the money to provide a fund out of which the back streets in the town could be lighted. There were 30 miles of these streets, and up to the present none of them had been lighted except where it happened that a light in the main street shone down the back street. For many years there had been a very strong agitation, especially on the part of the working classes, to have lamps put in the back streets. The Corporation had deferred taking the matter up because these streets were all paved and pitched. The demand having become so insistent, the Gas Committee instructed their Engineer (Mr. J. P. Leather) to prepare a report on the matter. He stated that the total cost would be £5000, and the annual expenditure of maintaining and lighting the lamps would be £1087, or equal to a rate of $\frac{5}{8}$d. in the pound. It was not intended that the work should be done all at once, but gradually, beginning with the worst places. Two members of the Committee supported the application, for special reasons which were given by one of them, and acquiesced in by the Inspector.

APPLICATIONS FOR LETTERS PATENT.

8716.—Galetz, A., and Piontek, K., "Acetylene burners." April 14.
8730.—Kirke, P. St. G., M'Court, C. D., and Bonecourt Surface Combustion, Ltd., "Combustion of combustible mixtures." April 14.
8735.—Gould, H. W., "Regulating flow of fluids." April 14.
8779.—Webber, W. A., and Payne, G. F., "Prepayment gas-meters." April 14.
8796.—Wolf, F. E., "Determining the specific weight of gases." April 14.
8803.—Boys, C. V., "Heat treatment of fluids." April 15.
8883.—Heyl, G. E., and Baker, T. T., "Regulating the flow of gas and air." April 15.
9041.—Wilkinson, G., "Automatically controlling temperature." April 17.
9042.—Willis, J. V., "Holders for gas-globes." April 17.
9074.—Palmer, J. L., "Gas-generators." A communication from Mrs. Shearer. April 17.
9176.—Elborne, S. L., and Godsal, H., "Gas-retorts." April 18.
9217.—Ostrorog, Count, "Igniting burners." April 19.
9231.—Picken, J., "Pipe-joints." April 19.
9252.—Podmore, A. E., "Inverted burners." April 19.
9253.—Podmore, A. E., "Gas-lamps." April 19.

GAS COMPANIES' STOCK AND SHARE LIST.

Business on the Stock Exchange was very quiet last week. Piety and sport—Jewish religious observances and Epsom counter attractions—conspired to reduce the attendance; and it was account week. Then, in addition, there were outside influences. First, a Budget speech that was too "glowing" by half; and next, the audacious capture of Scutari and the snapping of Montenegrin fingers under the dignified noses of the Powers. This set-back was very annoying to markets that were longing to advance and felt they could do it if they had a fair chance; but they did not give way, and some did more than keep their prices up. The opening on Monday was depressed by the unfavourable appearance of Danubian relations, and the tone was dull. Government issues were not strong, but Consols did not move. Rails zigzagged irregularly; and Americans were uneven, but had more ups than downs. Tuesday was a very quiet day; but the tone was more cheerful. Gilt-edged were firm, and Consols rose $\frac{1}{8}$. Rails were well supported at higher figures, and Americans advanced. Wednesday was just as quiet; but the tendency held firm. Markets mostly were nice and steady; but American relapsed. On Thursday, the dead stillness was accentuated, and there was hardly any feature except a feeling of nervousness about Montenegro. Markets tended to droop; but Home Government issues were apathetic, and Consols remained unchanged. Rails gave way, but not much; and the Foreign Market was calm. All Americans were quite flat. Friday opened shyly, but after a while they gathered courage, clinging confidently to the belief that the peace of Europe must be maintained. Gilt-edged were firm, and Consols, which had been hanging fire, rose $\frac{1}{8}$. Rails were rather ragged, the tendency not being uniform; and Foreign were fairly good. Saturday was quiet, of course, but the tone was bright—a pacific solution of Eastern affairs still being insisted on. Consols were steady, closing at 74$\frac{7}{8}$ to 75$\frac{1}{8}$—a rise of $\frac{1}{4}$ in the week. Rails were supported by buyers and prices kept up, and Americans showed some improvement. In the Money Market, the tendency at first was quite easy; but rates steadied later on, and closed firm. Business in the Gas Market was a good bit quieter; the aggregate being well below the average. A noteworthy feature of it was that, with the exception of only about a dozen transactions, the whole business was confined to the issues of four undertakings. If, as appears probable, this arises from stock and shares of the rest being scarce in the market, it shows that holders are not at all desirous of parting. In Gaslight and Coke issues, the ordinary was moderately dealt in at steady and practically unchanged figures, bargains ranging from 102$\frac{3}{4}$ to 103. In the secured issues, the preference was done at 96$\frac{3}{4}$ to 98, and the debenture at 73$\frac{1}{2}$ and 74. South Metropolitan was much more active, but not so firm, changing hands at 111$\frac{1}{2}$ to 113—a fall of 1. In Commercials, the 4 per cent. realized 104 and 105$\frac{1}{2}$, and the 3$\frac{1}{2}$ per cent. 101$\frac{1}{4}$. Among the Suburban and Provincial group, Brentford old marked 264 and 265, and nothing else was touched. In the Continental companies, Imperial changed hands at 172$\frac{1}{2}$ and 173$\frac{1}{2}$, Union at 84$\frac{1}{2}$ and 85 (a fall of 1), ditto preference at 131$\frac{1}{2}$, European at 17$\frac{3}{4}$ to 18$\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres debenture fetched 92 and 92$\frac{1}{2}$, Primitiva 6$\frac{3}{4}$ to 6$\frac{7}{8}$ (a fall of $\frac{1}{8}$), ditto preference 5 to 5$\frac{1}{8}$ (a fall of $\frac{1}{16}$), ditto debenture 95, and San Paulo preference 11$\frac{3}{8}$.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	73—76	−1	6 11 7
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	84—87	..	4 12 0
280,000	5	April 11	7½	Bombay, Ltd.	6½—6¾*	..	5 11 1
50,000	10	Feb. 27	15	Bourne- mouth Gas & Water	10 p.c. 28½—29½	..	5 1 8
332,000	10	,,	7		B 7 p.c. 15⅝—16⅛	..	4 6 8
75,000	10	,,	6		Pref. 6 p.c. 13⅝—14⅛	..	4 4 3
380,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	206—211	..	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	151—154	..	5 3 11
530,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	89—91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91½—93½	..	4 5 7
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
160,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	104—106	..	5 3 1
560,000	,,	,,	5⅝	Do. 3½ p.c. do.	101—103	..	5 3 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	83—86	−1	4 13 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5⅞	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	17½—18½	..	5 8 1
16,415,840	Stk.	Feb. 13	4/17/4	Gas-light and Coke	4 p.c. Ord. 101½—103½	..	4 14 2
2,600,000	,,	,,	3½		3½ p.c. max. 80—83	..	4 4 4
4,062,235	,,	,,	4		4 p.c. Con. Pref. 96—98	..	4 1 8
4,674,850	,,	Dec. 12	3		3 p.c. Con. Deb. 73—75	..	4 0 0
268,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	89—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	April 25	11	Hongkong & China, Ltd.	16½—17*	..	6 9 5
131,000	Stk.	Mar. 13	7⅛	Ilford A and C	152—155	..	4 18 4
65,780	,,	,,	6⅓	Do. B	120—122	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,060	Stk.	Nov. 14	9	Imperial Continental	171—176	..	5 2 3
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	85—87	..	4 0 6
200,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.	120—123	..	4 17 7
561,000	Stk.	Feb. 27	10	Liverpool United A	213—215	−2	4 13 0
718,100	,,	,,	7	Do. B	151—153	−3	4 11 6
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4¼—4⅞	..	6 6 4
250,000	100	April 1	4½	Met. of Melbourne	4½ p.c. Deb.	98—100	..	4 10 0
541,920	20	Oct. 30	3½	Monte Video, Ltd.		12⅞—13½	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.		98½—99½	+½	4 10 6
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.		85—86	−½	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.		13—14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.		127—132	..	6 1 3
60,000	5	Mar. 28	10	Ottoman, Ltd.		8—8½	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B		125—128	..	5 1 7
100,000	50	,,	12	Do. C		122—125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.		6⅞—7⅛	−⅛	5 12 8
499,960	5	Dec. 30	5	,, 5 p.c. Pref.		4¹³⁄₁₆—5⅛	−1/16	4 16 5
521,600	100	Dec. 2	4	,, 4 p.c. Deb.		95—97	−1	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.		92—94	..	4 5 1
275,000	5	Apl. 11	12	San Paulo, Ltd.		—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.		11½—11¾*	..	5 2 2
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		49—51	..	4 18 0
135,000	Stk.	Mar. 13	10	Sheffield A		224—226	..	4 8 6
209,984	,,	,,	10	Do. B		223—225	..	4 8 11
523,500	,,	,,	10	Do. C		224—226	..	4 8 6
90,000	10	Sept. 27	7½	South African		10—11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.		111—113	−1	4 16 8
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.		73—75	..	4 0 0
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.		161—164	..	5 4 4
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.		117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.		115—117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.		117—119	..	4 4 0
594,740	Stk.	Nov. 14	5	Southampton Ord.		102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham and Edmonton	A 5 p.c.	139—142	..	5 2 1
483,940	,,	,,	5⅞		B 3½ p.c.	115—117	..	4 18 3
149,470	,,	Dec. 30	4		4 p.c. Deb.	92—94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.		5—6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		96—98	..	5 2 0
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.		115—116	..	4 6 2
255,636	Stk.	Mar. 13	6⅞	Wands-worth	B 3½ p.c.	137—140	..	4 18 2
85,766	,,	Dec. 30	3		3 p.c. Deb. Stk.	68—70	..	4 5 9

Prices Marked * are "Ex. Div."

At the regular weekly meeting of the London County Council last Tuesday, the recommendation of the Fire Brigade Committee to the effect that the widow of the fireman Libby, who lost his life in the recent sewer fatality, should be granted a pension of £30 per annum, was agreed to.

Messrs. Edward Cockey and Sons, Limited, of Frome, have recently been successful in securing contracts for six purifiers, 30 ft. by 40 ft., with superstructure and roof, for the Bournemouth Gas and Water Company; and for two 20-feet square boxes for the Andover Lighting and Power Company, with one of the firm's double-covered centre-valves.

The Richmond Gas Stove and Meter Company, Limited, send a copy of their latest summer abridged list of gas-cookers and other apparatus. It is a compact booklet of 48 pages in a wrapper having an appropriate design effectively printed in colours.

We have received from the Gas and Water Engineer of the Rhyl Urban District Council (Mr. Leonard G. Hall, Assoc.M.Inst.C.E.) a copy of a small pamphlet he has prepared bearing the title of "A Brief History of the Water Supply of Rhyl and District." The author furnishes some interesting particulars of the water-works, which have been under his supervision for twenty years. A view of the Dolwen reservoir, completed in 1905, is given as a frontispiece.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WATER ENGINEER. Sheffield Water Department. Applications by May 15.
DRAUGHTSMAN. No. 5723.
TRAVELLERS. "J," 4, Dollis Road, Finchley.
FOREMAN (STOVE REPAIRING SHOP). No. 5728.
WORKING FOREMAN. Millom Gas and Water Department.

Appointments, &c., Wanted.

LEADBURNER. No. 5715.

Partner or Director Wanted.

AIR GAS BUSINESS. Arnold and Co., 76, Cannon Street, E.C.

Plant, &c. (Second-Hand), For Sale.

GASHOLDER. Cambridge Gas Company.

Patent Licences, &c.

ACETYLENE GENERATORS. F. W. Golby, 36, Chancery Lane, W.C.
MANTLES. W. G. Potter, 45, Monsell Road, Finsbury Park, N.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. London Mart. May 6.
BOGNOR GASLIGHT AND COKE COMPANY. London Mart. May 6.
GREAT YARMOUTH WATER COMPANY. London Mart. May 6.
SOUTHEND WATER COMPANY. London Mart. May 20.
SUTTON GAS COMPANY. London Mart. May 6.
SWANSEA GASLIGHT COMPANY. By Auction. Hotel Metropole, Swansea. May 6.
WANDSWORTH, &c., GAS COMPANY. London Mart May 20.

TENDERS FOR

Benzol, Crude (Wanted). No. 5718.

Coal.

BANGOR (N.W.) GAS DEPARTMENT. Tenders by May 12.
BROADSTAIRS GAS COMPANY. Tenders by May 7.
CLONMEL GAS DEPARTMENT. Tenders by May 8.
EASTBOURNE GAS COMPANY. Tenders by May 1.
FORFAR GAS CORPORATION. Tenders by May 8.
GLOSSOP GAS COMPANY. Tenders by May 3.
HEYWOOD GAS DEPARTMENT. Tenders by May 11.
LINCOLN GAS DEPARTMENT. Tenders by May 17.
RAMSGATE CORPORATION. Tenders by May 12.
SOUTH SUBURBAN GAS COMPANY. Tenders by May 5.

Coke.

HUDDERSFIELD GAS DEPARTMENT. Tenders by May 10.

Condensing and Scrubbing Plant.

ROCHDALE CORPORATION. Tenders by May 7.

General Stores (Sulphuric Acid).

FORFAR GAS CORPORATION. Tenders by May 8.

Meters.

FORFAR GAS CORPORATION. Tenders by May 8.

Oxide (Spent).

No. 5729.

Pipes, &c.

FORFAR GAS CORPORATION. Tenders by May 8.
MORECAMBE GAS DEPARTMENT. Tenders by May 3.

Purifier and Scrubber Alterations, &c.

BRIDGNORTH GAS DEPARTMENT. Tenders by May 3.

Tar, Liquor, and Other Residuals.

FORFAR GAS CORPORATION. Tenders by May 8.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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